

HRS DOCUMENTATION RECORD COVER SHEET

Name of Site: Jard Company, Inc.

EPA ID No.: VTD048141741

Contact Persons

Site Investigation:	Weston Solutions, Inc. (WESTON)/ Superfund Technical Assessment and Response Team III (START) 3 Riverside Drive Andover, MA 01810 (Mr. G. Hornok, Ms. C. Casiello Imbres, Ms. S. Bitzas, and Mr. J. F. Kelly)	(978) 552-2100
Documentation Record:	U.S. Environmental Protection Agency (EPA) Region I 5 Post Office Square, Suite 100 Boston, MA 02109-3912 (Ms. Martha Bosworth and Ms. Nancy Smith)	(617) 918-1407

Pathways, Components, or Threats Not Scored

The surface water overland/flood migration component, and the soil exposure and air migration pathways were not scored as part of this Hazard Ranking System (HRS) documentation record, as the scoring of the ground water migration pathway and the ground water to surface water migration component of the surface water pathway are sufficient to qualify the site for the National Priorities List (NPL).

Surface Water Overland/Flood Migration Pathway (component not scored)

Surface water runoff has potentially been responsible for the limited migration of polychlorinated biphenyls (PCBs) to drainage swales and sewers immediately adjacent to the Jard Company Inc. property [10, pp. 72, 148-149, 214-218, 234-235; 31, pp. 33, 56-57; 41, pp. 1-4]. In addition, flood events, including one event in August 2011, may have caused the migration of hazardous substances associated with source areas on the Jard property [126, p. 28; 127]. The ground water to surface water component is a primary mechanism of transport of hazardous substances associated with the site (see ground water to surface water component section) [31, pp. 56-57; 65, pp. 28, 54]. The HRS directs selecting the higher of the two scores for the two components of the surface water migration pathway, therefore, the overland/flood migration component is not included in the HRS scoring of this site [1, pp. 51604-51605, Section 4.0.1].

Soil Exposure Pathway (not scored)

Sampling has documented the presence of PCB contamination in surface soils on residential properties within 200 feet of residences, downgradient of the Jard Company, Inc. property [10, pp. 77, 187, 190-193, 200-202, 204-205, 208-210, 224-226, 228-231, 249, 252]. Due to the limited number of residents impacted by the PCB contamination, this pathway does not contribute significantly to the listing decision. Therefore, this pathway is not evaluated in the HRS scoring of this site.

Air Migration Pathway (not scored)

No release of hazardous substances to the ambient air from sources has been documented to have occurred, and no impacts to nearby residential populations or sensitive environments have been documented. The evaluation of

the air migration pathway would not impact the listing decision. Therefore, this pathway is not evaluated in the HRS scoring of this site.

HRS DOCUMENTATION RECORD

Name of Site: Jard Company, Inc.

Date Prepared: May 2014

EPA Region: 1

Street Address of Site*: 259 Bowen Road

City, County, State, Zip Code: Bennington, Bennington County, Vermont, 05201

General Location in the State: Southwestern Vermont

Topographic Map: U.S. Geological Survey, Bennington, Vermont-Bennington Co., 7.5-minute series Topographical Map. 1954. [3].

Latitude: 42° 53' 19.9" North

Longitude: 73° 11' 20.8" West

Ref: [3; 5; 6]

*The street address, coordinates, and contaminant locations presented in this HRS Documentation Record identify the general area the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, disposed, or placed, or has otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

Scores

Air Pathway	0
Ground Water Pathway	60.00
Soil Exposure Pathway	0
Surface Water Pathway	100.00

HRS SITE SCORE	58.31
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WORKSHEET FOR COMPUTING HRS SITE SCORE

	S	S ²
1. Ground Water Migration Pathway Score (S _{gw}) (from Table 3-1, line 13)	60.00	3,600
2a. Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	NS	NS
2b. Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	100.00	10,000
2c. Surface Water Migration Pathway Score (S _{sw}) Enter the larger of lines 2a and 2b as the pathway score.	NS	NS
3. Soil Exposure Pathway Score (S _s) (from Table 5-1, line 22)	NS	NS
4. Air Migration Pathway Score (S _a) (from Table 6-1, line 12)	NS	NS
5. Total of S _{gw} ² + S _{sw} ² + S _s ² + S _a ²		13,600
6. HRS Site Score Divide the value on line 5 by 4 and take the square root		58.31

HRS Table 3-1 – Ground Water Migration Pathway Scoresheet

Factor Categories and Factors	Maximum Value	Value Assigned
Likelihood of Release to an Aquifer:		
1. Observed Release	550	550
2. Potential to Release:		
2a. Containment	10	NS
2b. Net Precipitation	10	NS
2c. Depth to Aquifer	5	NS
2d. Travel Time	35	NS
2e. Potential to Release [lines 2a x (2b + 2c + 2d)]	500	NS
3. Likelihood of Release (higher of lines 1 and 2e)	550	550
Waste Characteristics:		
4. Toxicity/Mobility	(a)	10,000
5. Hazardous Waste Quantity	(a)	10,000
6. Waste Characteristics	100	100
Targets:		
7. Nearest Well	50	50
8. Population:		
8a. Level I Concentrations	(b)	40
8b. Level II Concentrations	(b)	0
8c. Potential Contamination	(b)	NS
8d. Population (lines 8a + 8b + 8c)	(b)	40
9. Resources	5	NS
10. Wellhead Protection Area	20	NS
11. Targets (lines 7 + 8d + 9 + 10)	(b)	90
Ground Water Migration Score For An Aquifer:		
12. Aquifer Score [(lines 3 x 6 x 11)/82,500] ^c	100	60
Ground Water Migration Pathway Score:		
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated) ^c	100.00	60.00

^aMaximum value applies to waste characteristics category.

^bMaximum value not applicable.

^cDo not round to nearest integer.

HRS Table 4-25 – Ground Water To Surface Water Migration Component Scoresheet

Factor Categories and Factors	Maximum Value	Value Assigned
Drinking Water Threat		
Likelihood of Release to an Aquifer:		
1. Observed Release	550	550
2. Potential to Release:		
2a. Containment	10	NS
2b. Net Precipitation	10	NS
2c. Depth to Aquifer	5	NS
2d. Travel Time	35	NS
2e. Potential to Release (lines 2a x [2b + 2c + 2d])	500	NS
3. Likelihood of Release (higher of lines 1 and 2e)	550	550
Waste Characteristics:		
4. Toxicity/Mobility/Persistence	(a)	NS
5. Hazardous Waste Quantity	(a)	NS
6. Waste Characteristics	100	NS
Targets:		
7. Nearest Intake	50	NS
8. Population:		
8a. Level I Concentrations	(b)	NS
8b. Level II Concentrations	(b)	NS
8c. Potential Contamination	(b)	NS
8d. Population (lines 8a + 8b + 8c)	(b)	NS
9. Resources	5	NS
10. Targets (lines 7 + 8d + 9)	(b)	—
Drinking Water Threat Score:		
11. Drinking Water Threat Score ([lines 3 x 6 x 10]/82,500, subject to a maximum of 100)	100	—
Human Food Chain Threat		
Likelihood of Release:		
12. Likelihood of Release (same value as line 3)	550	550
Waste Characteristics:		
13. Toxicity/Mobility/Persistence/Bioaccumulation	(a)	5×10^8
14. Hazardous Waste Quantity	(a)	10,000

Factor Categories and Factors		Maximum Value	Value Assigned
15.	Waste Characteristics	1,000	1,000
Targets:			
16.	Food Chain Individual	50	20
17.	Population:		
17a.	Level I Concentrations	(b)	NS
17b.	Level II Concentrations	(b)	NS
17c.	Potential Human Food Chain Contamination	(b)	0.000018
17d.	Population (lines 17a + 17b + 17c)	(b)	0.000018
18.	Targets (lines 16 + 17d)	(b)	20.000018
Human Food Chain Threat Score			
19.	Human Food Chain Threat Score ([lines 12 x 15 x 18]/82,500, subject to a maximum of 100)	100	100
Environmental Threat			
Likelihood of Release:			
20.	Likelihood of Release (same value as line 3)	550	550
Waste Characteristics:			
21.	Ecosystem Toxicity/Mobility/ Persistence/Bioaccumulation	(a)	5×10^8
22.	Hazardous Waste Quantity	(a)	10,000
23.	Waste Characteristics	1,000	1,000
Targets:			
24.	Sensitive Environments:		
24a.	Level I Concentrations	(b)	0
24b.	Level II Concentrations	(b)	25
24c.	Potential Contamination	(b)	NS
24d.	Sensitive Environments (lines 24a + 24b + 24c)	(b)	25
25.	Targets (value from 24d)	(b)	25
Environmental Threat Score:			
26.	Environmental Threat Score ([lines 20 x 23 x 25]/82,500, subject to a maximum of 60)	60	60
Ground Water To Surface Water Migration Component Score For A Watershed			
27.	Watershed Score ^c (lines 11 + 19 + 26, subject to a maximum of 100)	100	100
Ground Water To Surface Water Migration Component Score			
28.	Component Score (S_{gw}) ^c , (highest score from line 27 for all watersheds evaluated, subject to a maximum of 100)	100.00	100.00

^aMaximum value applies to waste characteristics category.

^bMaximum value not applicable.

^cDo not round to nearest integer.

ACRONYMS

<	Less than
1,1,1-TCA	1,1,1-Trichloroethane
ANR	Agency of Natural Resources
bgs	Below Ground Surface
CAFI	Corrective Action Feasibility Investigation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CRQL	Contract Required Quantitation Limit
DEHP	Bis(2-ethylhexyl)phthalate
DNAPL	Dense Non-Aqueous Phase Liquid
DOP	Di-octyl phthalate
EPA	U.S. Environmental Protection Agency
ft ²	square feet
GIS	Geographic Information System
GPS	Global Positioning System
HRS	Hazard Ranking System
HWQ	Hazardous Waste Quantity
ID	Identification
J	Value is Estimated
Jard	Jard Company Inc.
KVA	kilo volt ampere
Lockheed	Lockheed Martin Technology Services Group
MCL	Maximum Contaminant Level
µg/L	Micrograms Per Liter
µg/Kg	Micrograms Per Kilogram
msl	Mean Sea Level
NHB	New Hampshire Boring, Inc.
No.	Number
NPL	National Priorities List
NS	Not Scored
NWI	National Wetland Inventory
PA/SI	Preliminary Assessment/Site Investigation
PCB	Polychlorinated Biphenyl
PEM	Palustrine Emergent
Phase II ESA	Limited Phase II Environmental Site Assessment
PPE	Probable Point of Entry
ppm	parts per million
PRP	Potentially Responsible Party
PSS	Palustrine Scrub-Shrub
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
SOW	Statement of Work
SR	Site Reassessment
START	Superfund Technical Assessment and Response Team III

ACRONYMS

Stone	Stone Environmental, Inc.
SVOCs	Semivolatile Organic Compounds
SWP	Surface Water Pathway
TCE	Trichloroethylene
TDL	Target Distance Limit
U	Value was not detected
USFWS	United States Fish and Wildlife Service
UST	Underground storage tank
VOCs	Volatile organic compounds
VT	Vermont
VT ANR DEC	Vermont Agency of Natural Resources Department of Environmental Conservation
VTrans	Vermont Agency of Transportation
Wehran	Wehran Engineering Corporation
WESTON	Weston Solutions, Inc.
yd ³	cubic yards

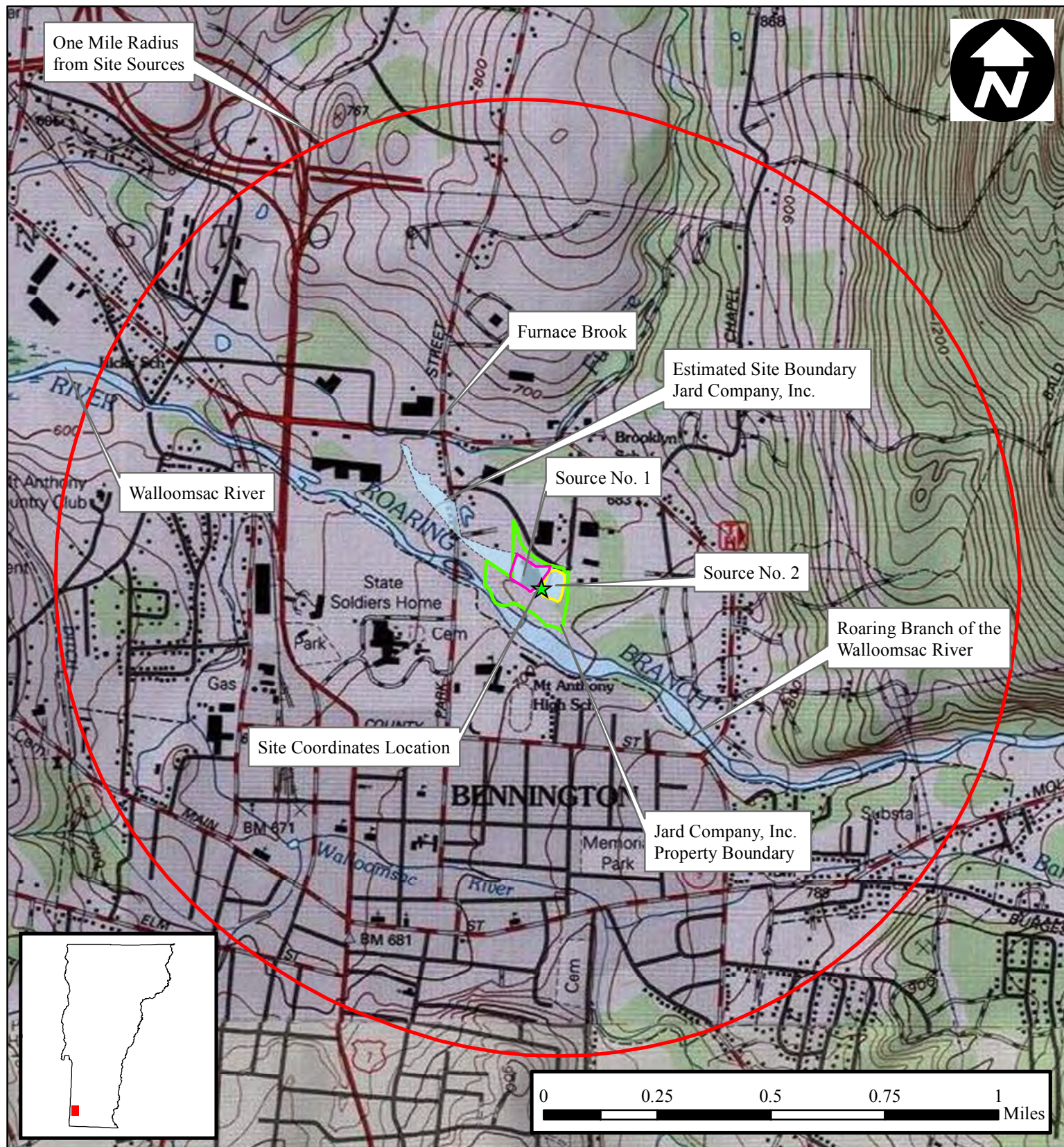


Figure 1

Site Location Map

**Jard Company, Inc.
259 Bowen Road
Bennington, Vermont**

**EPA Region I
Superfund Technical Assessment and
Response Team (START) III
Contract No. EP-W-05-042**

TDD Number: 01-13-09-0001
Created by: S.Bitzas
Created on: 2 October 2013
Modified by: E. Mulholland
Modified on: 7 March 2014

Data Sources:

Basemap: Bing USA Topo Maps (Microsoft) [3].
Parcel Data: Town of Bennington Parcels [111].
All other data: Weston START [4; 10]



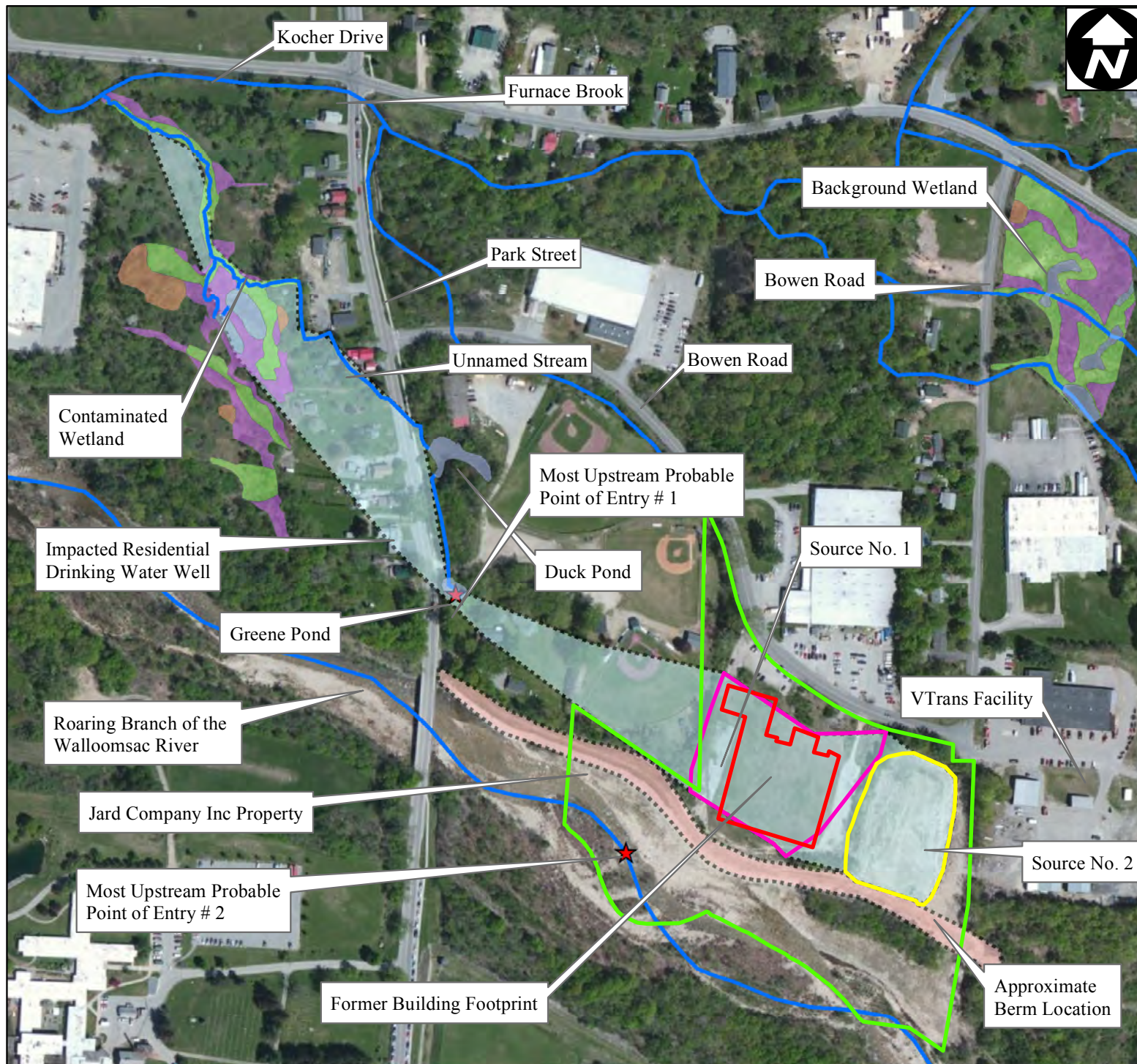


Figure 2

Site Area Map

**Jard Company, Inc.
259 Bowen Road
Bennington, Vermont**

**EPA Region I
Superfund Technical Assessment and
Response Team (START) III
Contract No. EP-W-05-042**

TDD Number: 01-13-09-0001

Created by: G. Hornok

Created on: 11 January 2013

Modified by: E. Mulholland

Modified on: 7 March 2014

Legend

- Former Building Footprint
- Jard Property Boundary
- Pile Base
- Contaminated Soil
- Waterbody
- ★ PPE
- Surfacewater

Wetland Type

- Emergent
- Forested
- Scrub/Shrub
- Estimated Site Boundary

0 100 200 300 400 500
Feet

Data Sources:

Imagery: Bing Maps Aerial (Microsoft) [112]

Parcel Data: VT DEC GIS [111]

All other data: Weston START [4; 10]

Building Footprint [62; 70]





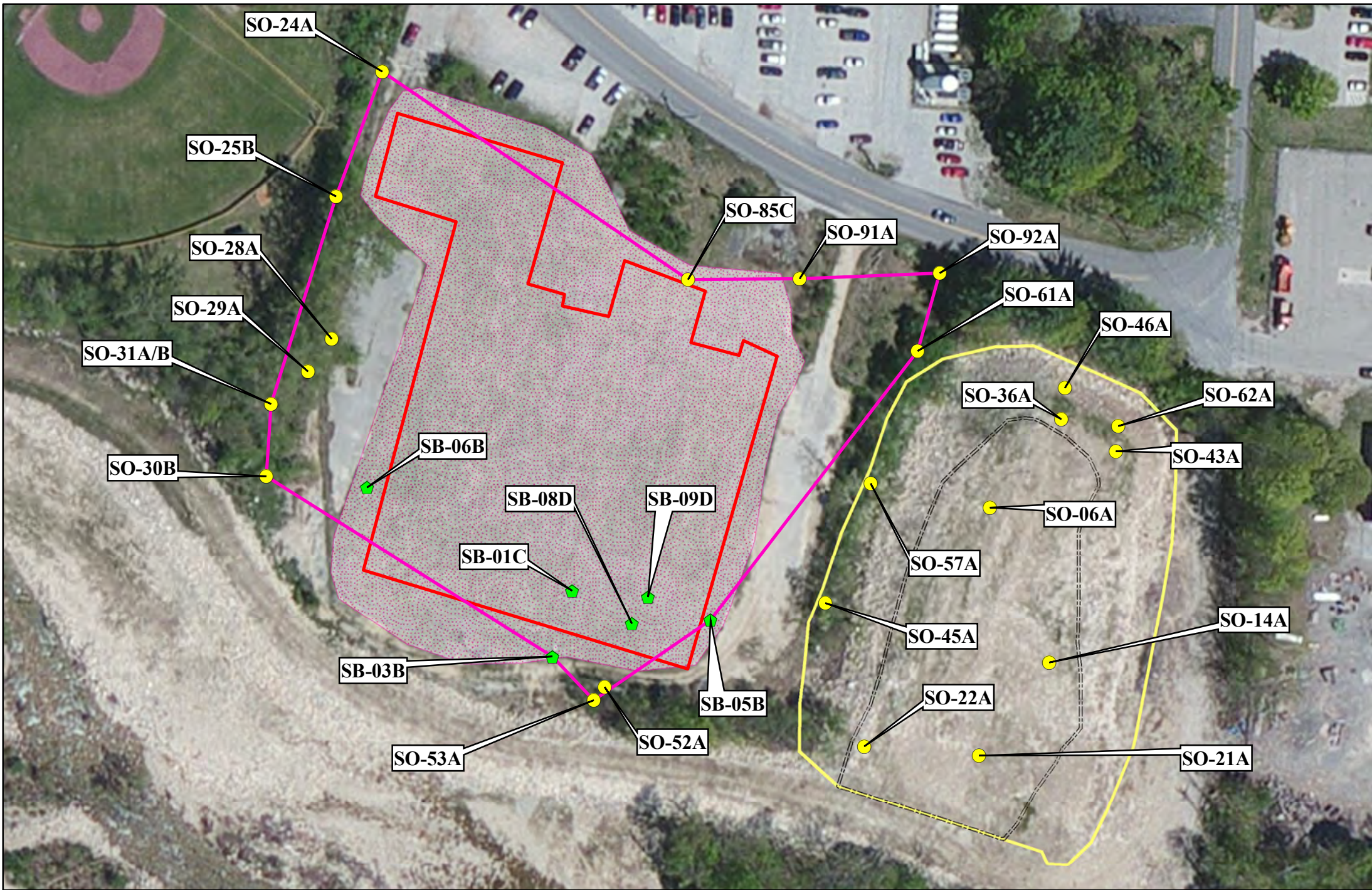


Figure 3B
Source Area
Sample Location Map
Jard Company, Inc.
259 Bowen Road
Bennington, Vermont

EPA Region I
Superfund Technical Assessment and
Response Team (START) III
Contract No. EP-W-05-042
TDD Number: 13-09-0001
Created by: G. Hornok
Created on: 14 October 2013
Modified by: E. Mulholland
Modified on: 7 March 2014

LEGEND

Sample Locations

- Soil Boring Sample
- Soil/Source Sample
- Contaminated Soil
- Former Building Footprint
- Approximate Cap
- Pile Top
- Pile Base

0 25 50 75 100 Feet

Data Sources:
 Imagery: Bing Maps Aerial (Microsoft) [112]
 All other data: Weston START [4, 10]
 Building Footprint [62, 70]



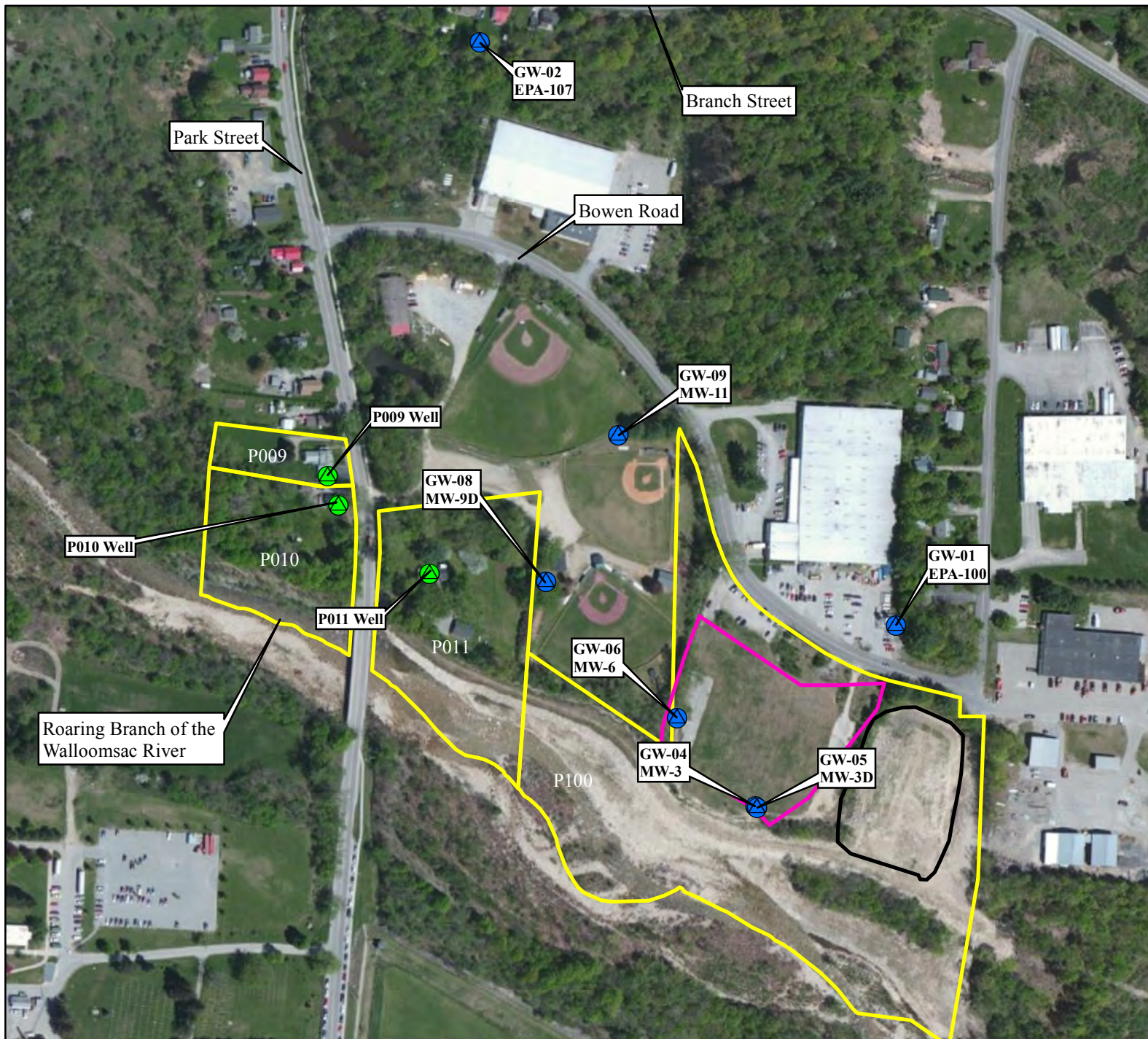







Figure 4
Ground Water and Drinking
Water Sample Location Map

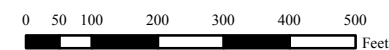
Jard Company, Inc.
259 Bowen Road
Bennington, Vermont

EPA Region I
Superfund Technical Assessment and
Response Team (START) III
Contract No. EP-W-05-042
TDD Number: 01-13-09-0001
Created by: S. Bitzas
Created on: 14 June 2013
Modified by: E. Mulholland
Modified on: 7 March 2014

Legend

-  Drinking Water Well*
-  Ground Water Sample
-  Source No. 1
-  Source No. 2
-  Approximate Property Boundary

* Note, Drinking Water Well locations are approximate.



Data Sources:
 Imagery: Bing Maps Aerial (Microsoft) [112]
 Topos: Bennington Quadrangle [3]
 Parcel Data: VT DEC GIS [111]
 All other data: START [10, pp. 167-169]



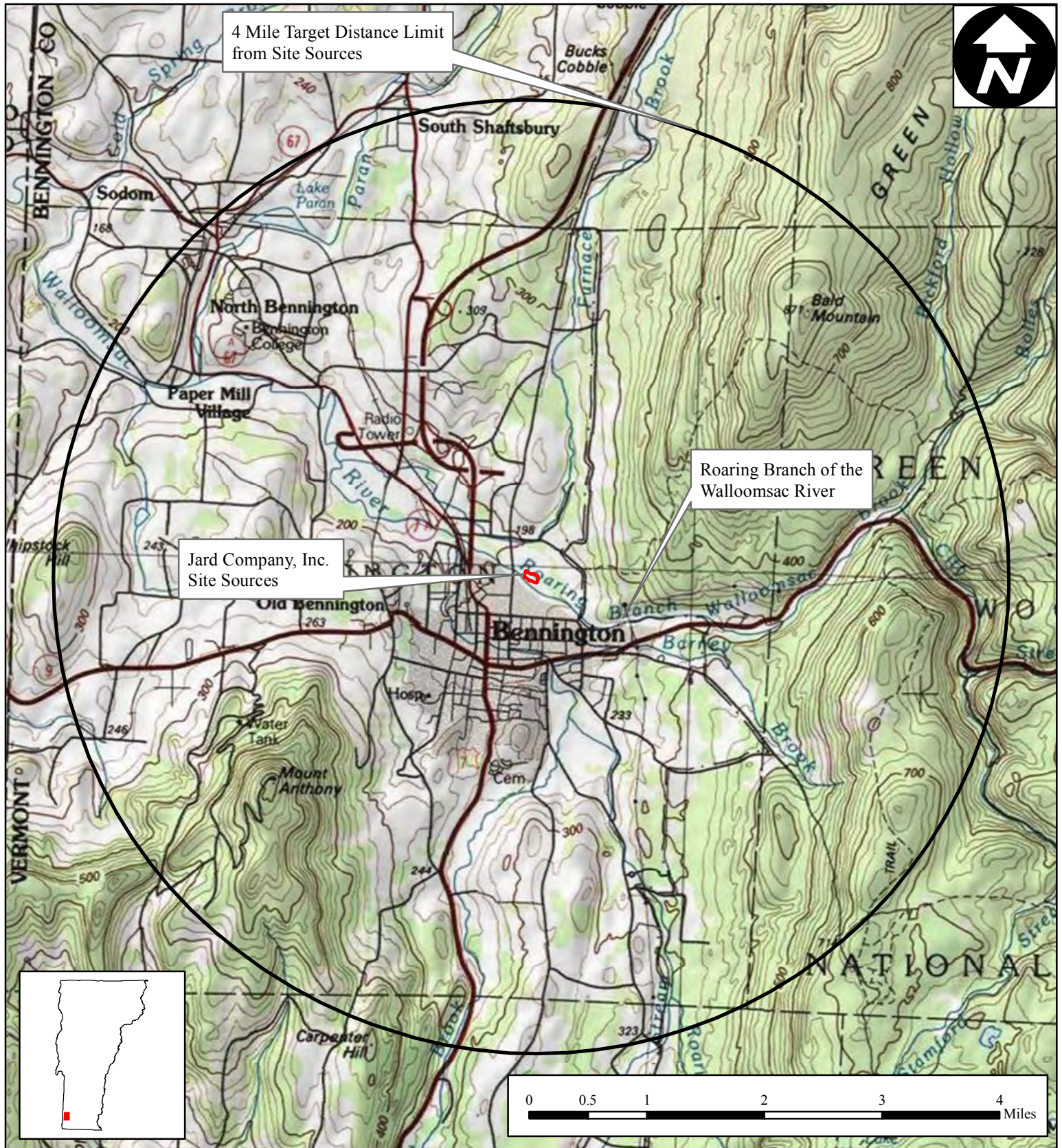


Figure 5

4 Mile Target Distance Limit

**Jard Company, Inc.
259 Bowen Road
Bennington, Vermont**

**EPA Region I
Superfund Technical Assessment and
Response Team (START) III
Contract No. EP-W-05-042**

TDD Number: 01-13-09-0001
Created by: S.Bitzas
Created on: 2 October 2013
Modified by: E. Mulholland
Modified on: 7 March 2014

Data Sources:

Basemap: Bing USA Topo Maps (Microsoft) [3].
All other data: Weston START [4; 10]





Figure 6A
Background Wetland Sediment
Sample Location Map
Jard Company, Inc.
259 Bowen Road
Bennington, Vermont


EPA Region I
Superfund Technical Assessment and
Response Team (START) III
Contract No. EP-W-05-042
TDD Number: 01-13-09-0001
Created by: S. Bitzas
Created on: 13 June 2013
Modified by: E. Mulholland
Modified on: 7 March 2014

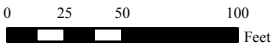
Legend

- Sediment Sample
- Approx. Property Boundary
- Waterbody

Wetland Type

- Emergent
- Forested
- Scrub/Shrub





Data Sources:
 Imagery: Bing Maps Aerials (Microsoft) [112]
 All other data: Weston START [4; 10]
 Town of Bennington Parcels [111]



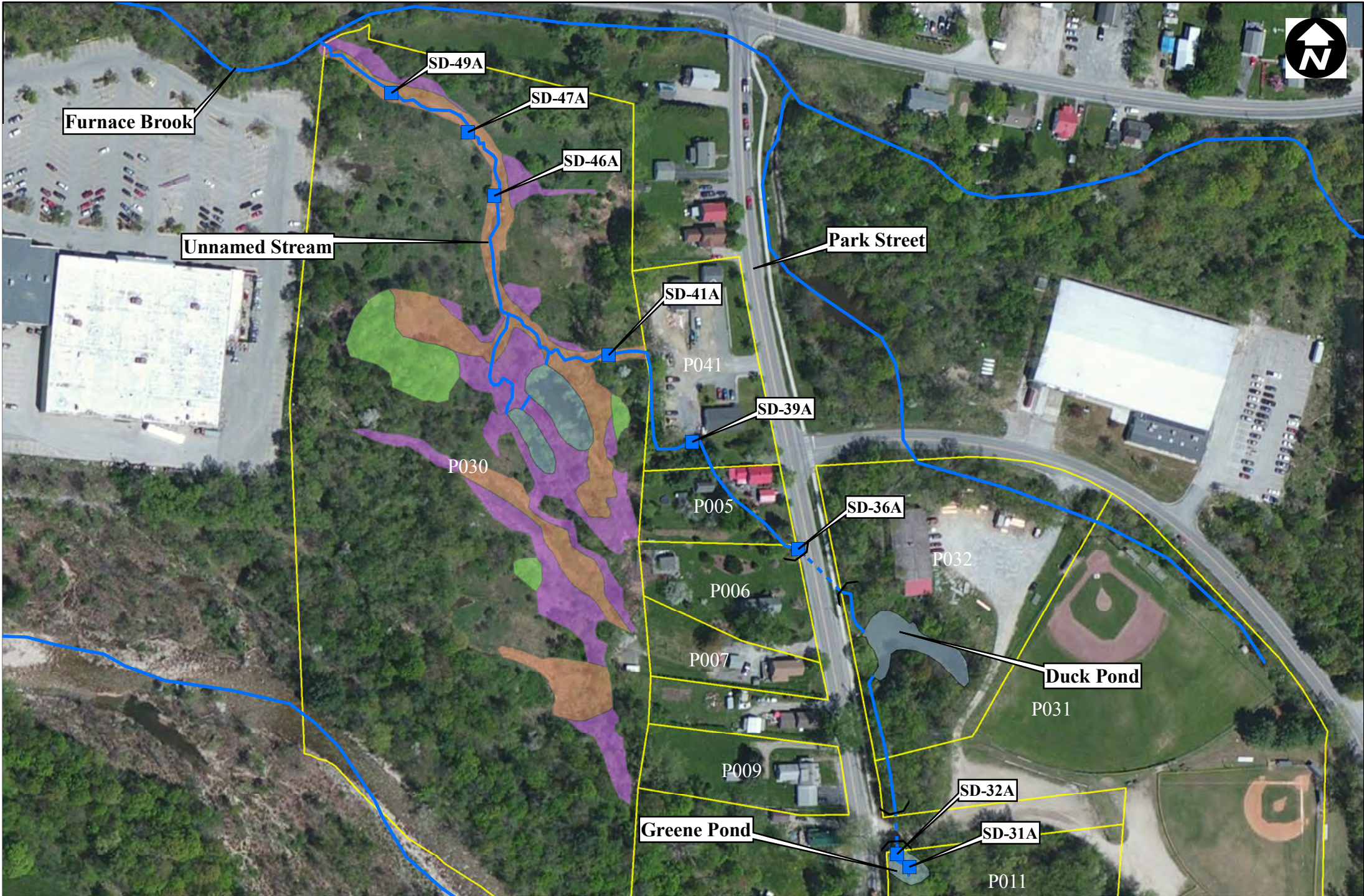


Figure 6B
Contaminated Wetland and
Sediment Sample Location Map

Jard Company, Inc.
259 Bowen Road
Bennington, Vermont

EPA Region I
Superfund Technical Assessment and
Response Team (START) III
Contract No. EP-W-05-042
TDD Number: 13-09-0001
Created by: G. Hornok
Created on: 24 April 2013
Modified by: E. Mulholland
Modified on: 7 March 2014

LEGEND

- Sediment Sample
- Surface Water**
 - Surface Water Stream
 - - - Piped
- Wetland Type**
 - Emergent
 - Forested
 - Scrub/Shrub
 - Approx. Property Boundary
 - Water Body
 - Culvert
- 0 50 100 200
Feet

Data Sources:
Imagery: Bing Maps Aerials (Microsoft) [112]
All other data: Weston START [4; 10]
Town of Bennington Parcels [111]



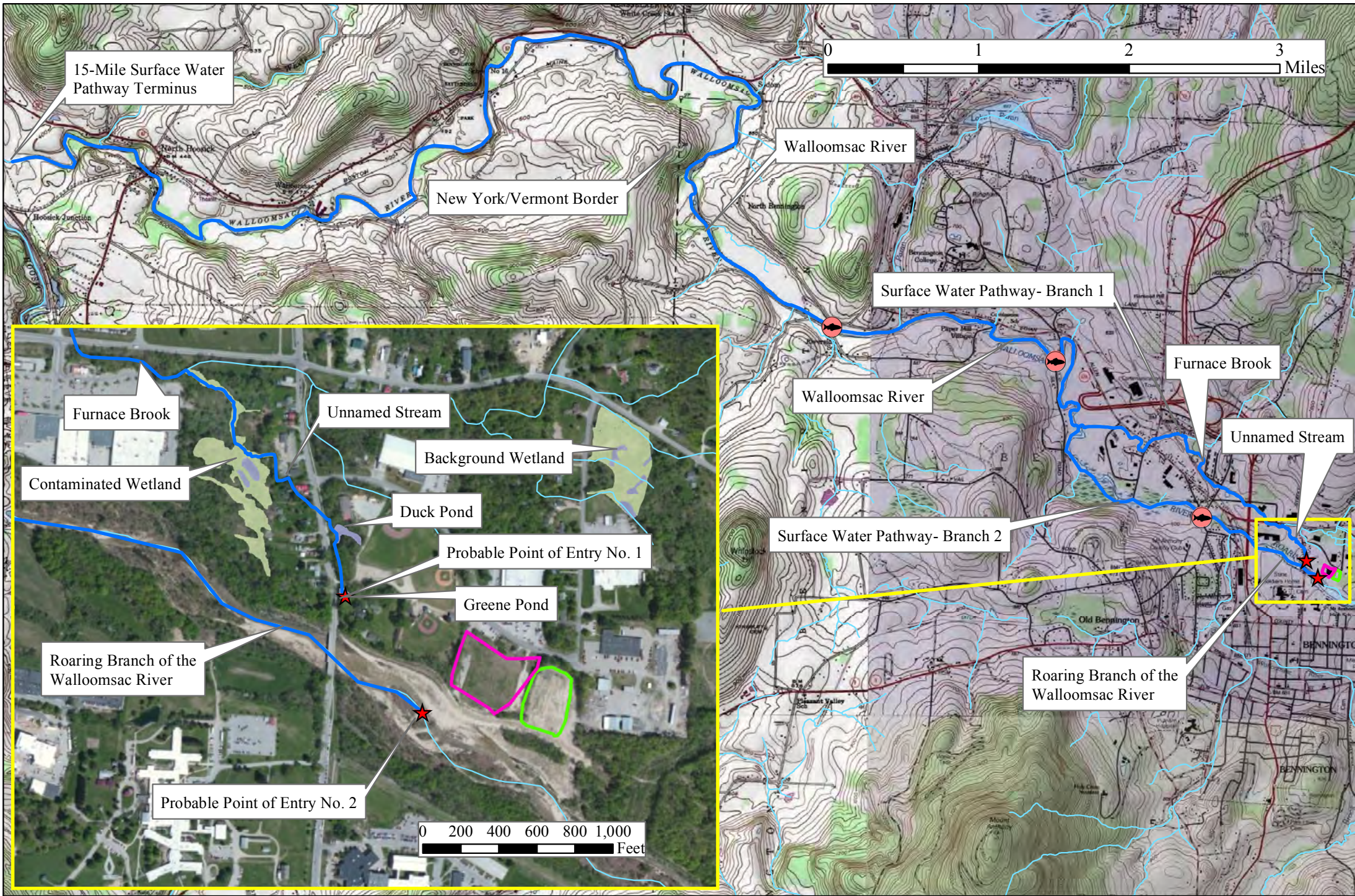


Figure 7
Surface Water Pathway
Target Distance Limit
Jard Company, Inc.
259 Bowen Road
Bennington, Vermont

EPA Region I
Superfund Technical Assessment and
Response Team (START) III
Contract No. EP-W-05-042
TDD Number: 13-09-0001
Created by: G. Hornok
Created on: 22 October 2013
Modified by: E. Mulholland
Modified on: 7 March 2014

Legend

- ★ Probable Point of Entry
- 🐟 Documented Fishery Location
- Surface Water Pathway
- Surface Water
- 🟪 Contaminated Soil Source
- 🟩 Pile Source

Data Sources:
 Imagery: Bing Maps Aerials (Microsoft) [112]
 Topos: USGS [3]
 All other data: Weston START [4; 10]



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- | Ref.
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|-------------|---|
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SITE SUMMARY

The Jard Company, Inc. site (Jard site) consists of the release of polychlorinated biphenyls (PCBs) from the Jard operations. The site includes a contaminated soil source and a contiguous soil pile containing PCBs originating from the Jard facility operations, and the estimated extent of the documented release of PCBs to the overburden aquifer downgradient of the sources, and to the surface water pathway via ground water to surface water migration. The contaminated soil source (Source 1) consists of an area of contaminated soil located where the former Jard building stood, and around the perimeter of the former building location. The soil pile, (Source 2), located to the east and immediately adjacent to Source 1, originated from soils located along the southern boundary of the Jard property adjacent to a berm (levee) between the Jard building and the Roaring Branch of the Walloomsac River. In 2010, as a result of the stream restoration project along the Roaring Branch, soils were excavated and relocated to the present location (Source 2) for the berm to be reconstructed closer to the facility [see Source Characterization sections]. From site sources, the Jard site extends northwest toward residential properties impacted by documented ground water contamination, and then continues north-northwest along the surface water pathway and wetland areas west of Park Street, terminating at the last point documented to contain source related contamination along the Unnamed Stream, just prior to Furnace Brook (see Figures 1 and 2). The release of PCBs has occurred to a private drinking water supply well and a sensitive environment, both located northwest of sources on the Jard Company, Inc. facility property (the Jard property) (see Figure 1). Based on sampling conducted in April 2013 as part of an EPA Site Reassessment (SR), these sources have been documented to contain PCBs (analyzed as Aroclor 1242) [see Source Characterization sections]. The site has contributed a release of PCBs to ground water and a downgradient drinking water supply well has been documented [see the Ground Water Migration Pathway section of this HRS Documentation Record]. This release has resulted in the closure of the private drinking water supply well serving four residents [see the Ground Water Migration Pathway section]. In addition, a release of PCBs to the surface water pathway, via ground water flow, and impacts to wetland frontage have been documented [see Surface Water Migration Pathway]. Previous flooding events, occurring along the Roaring Branch of the Walloomsac River, including August 2011, may have resulted in PCB contaminants migrating from Source Nos. 1 and 2 to the Jard surface water pathway (SWP) via the overland flow/flood component; this possible migration route is not scored as part of this evaluation [126, p. 28; 127, p. 1; 129; 133].

The Jard property is an approximately 11.26-acre parcel located at 259 Bowen Road in Bennington, Bennington County, Vermont (VT) (see Figure 1) [3; 5-7]. The parcel is identified by the Town of Bennington Property Map Number (No.) 45, as Lot No. 01-73 [7]. The geographic coordinates of the Jard site, as measured from the southeast corner of the former building footprint, within the contaminated soil source, are 42° 53' 19.9" north latitude and 73° 11' 20.8" west longitude (see Figure 1) [3; 5]. The Jard property is bordered to the north by Bowen Road; to the east by a Vermont Agency of Transportation (VTrans) maintenance facility; to the south by the Roaring Branch of the Walloomsac River; and to the west by recreational/baseball (Little League) fields and residential properties along Park Street (see Figure 2) [10, p. 3].

The Jard Company, Inc. (Jard) operated on the property from 1969 to 1989, producing zinc-coated capacitors (containing approximately 75 pounds of dielectric fluid), small non-fluid transformers [up to 75 kilo volt ampere (KVA)], and small motors (up to 200 watts) used in household appliances [20, p. 1; 23, pp. 1-2; 24, p. 5; 25, p. 1; 26, p. 2; 31, pp. 5, 8]. A variety of hazardous wastes were generated at the Jard property in association with its manufacturing processes, including PCBs, a variety of volatile organic compounds (VOCs) [including trichloroethylene (TCE); 1,1,1-trichloroethane (1,1,1-TCA); and toluene], semivolatile organic compounds (SVOCs) [including bis-(2-ethylhexyl)phthalate (DEHP) which is also known as di-octyl phthalate (DOP)], waste hydraulic and lubricating oils, waste paints and varnishes, waste zinc oxide, waste-contaminated rejected capacitors, spent Speedi DriTM, and PCB- and phthalate-contaminated wastewater [8, p. 21; 31, p. 8; 34, p. 1]. According to file information, the manufacture of the oil-filled capacitors first involved foil winding [23, p. 1]. The windings, which were housed in metal sleeves, were then sent to an oil impregnation line, where the capacitors would be filled with dielectric fluids [23, pp. 1-2]. Originally, PCB oil was used as a dielectric fluid, but was later replaced by DOP in 1978 [23, pp. 1-2; 25, p. 4]. After the oil impregnation, the capacitors were

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degreased, tested, and painted [23, p. 1; 25, p. 4]. Known degreasing agents observed and documented on the property include TCE [26, pp. 42-43].

According to a summary of PCBs in Vermont prepared by the Agency of Environmental Conservation Department of Water Resources Water Quality Division in April 1976, at the time Jard was the only known PCB user in VT [21, p. 2]. Jard received an average of 686,500 pounds of PCBs per year (1971-1974 average) at the Jard property [20, p. 5]. From 1969 to 1971, Aroclor 1242 was used as an impregnating fluid, but by 1971 Jard replaced this with Aroclor 1016 [20, p. 5; 21, p. 2]. By 1978, and until operations ceased in 1989, DOP, which replaced PCBs, was used as an impregnating fluid for the foil windings of the capacitors and transformers [29, p. 10]. Based on a letter to the U.S. EPA from Jard, the amount of Aroclor 1016 received by Jard each year from 1971 through 1974 was 142,000 pounds, 632,000 pounds, 963,000 pounds, and 677,000 pounds, respectively [20, p. 5]. In addition, 332,000 pounds of Aroclor 1242 were received at the Jard property in 1971 [20, p. 5]. The letter produced by Jard also indicated disposal of solid and liquid PCB waste in local sanitary sewers and solid waste facilities [20, pp. 1-6]. Rejected PCB-containing materials and oils were also shipped to disposal facilities for incineration or returned to the manufacturer [20, pp. 1-6; 22, pp. 1-2; 50, p. 3].

As part of the manufacturing process, Jard used non-contact cooling water, which was discharged to an underground storage tank (UST) south of the facility building for storage [21, p. 2; 31, pp. 47, 135; 37, p. 3; 39, pp. 15, 32; 50, p. 1]. Floor drains from inside the building also discharged into the UST, as well as potentially directly into underlying soils [39, p. 34; 50, p. 1]. The UST was connected to a concrete drywell, which was perforated by many one-inch slots and had three discharge pipes [29, pp. 7-9; 39, pp. 29, 32; 31, pp. 47, 135]. The drywell received overflow from the UST, and any overflow from the drywell was discharged to a drainage ditch in the front of the building [29, p. 7; 50, p. 2]. Overflow from the UST was also routed to a deep well which, along with the UST, provided cooling water for the manufacturing process [39, pp. 15, 32; 50, p. 2]. A subsequent interview with a former employee indicated that during the non-contact cooling process, gasket failures would cause the cooling waters and PCB-oils to come into contact [4, p. 27]. These potentially PCB-contaminated cooling waters would be discharged to the drywell system [4, p. 27]. The drywell was later removed during the 2006-2007 EPA Removal Action [62, pp. 4, 12]. Finally, an additional trench floor drain system, which discharged directly to soils beneath the building slab, was located in the southern end of the building in the former production area and was determined to contain elevated concentrations of PCBs during site investigations [31, pp. 31, 52; 39, pp. 15-16, 26, 30, 32, 36]. Releases of PCBs to the environment may have also occurred due to documented spills/leaks from containers and discharges to the municipal sewer system [20, pp. 2, 6].

Beginning with a routine industrial waste survey in October 1979, numerous inspections and investigations have taken place at the Jard property [23, pp. 1-3; 24, pp. 4-24; 25, pp. 2-22; 26, pp. 1-6; 29, pp. 3-28; 30, pp. 1-30; 31, pp. 5-58; 33, pp. 1-2; 36, pp. 4-30; 40, pp. 2-5; 41, pp. 1-4; 44, pp. 1-9; 46, pp. 11-17]. These inspections and investigations indicated PCB contamination in soils and ground water adjacent to and beneath the former facility building [24, pp. 13-22, 32; 29, pp. 8, 19-26; 30, pp. 11-37, 64-152; 31, pp. 27-42, 111-154; 36, pp. 9-10, 15-29; 39, pp. 20-68; 41, pp. 1-4; 44, pp. 3-4, 7, 9; 46, pp. 11-17, 21-26, 41-42; 59, pp. 1-3; 60, pp. 1-90; 62, pp. 24, 84-85; 65, pp. 9-61; 67, pp. 2-12; 68, pp. 3-4, 9-22]. To address some of the identified contamination, several EPA Removal Actions have been conducted at the Jard property to secure chemicals used in the manufacturing process which were left after the facility closed, conduct limited excavation of contaminated soils, demolish the facility building, remove a portion of the concrete foundation, and cap/secure PCB-contaminated soils to limit public exposure [37, pp. 7-8; 39, pp. 7-9; 42; 43; 62, pp. 4, 7-18, 24, 40-41]. Analytical results of soil samples collected from underneath the building, adjacent to the building footprint, and south of the building adjacent to the Walloomsac River have indicated the presence of TCE, DOP, and PCB Aroclors [24, pp. 13-19, 28-32; 29, pp. 18-26; 30, pp. 13-37, 64-152; 31, pp. 7-36, 112-154; 36, pp. 15-18; 62, pp. 24, 83-85; 65, pp. 12-20, 43]. Hazardous substances detected in ground water beneath the Jard property include, but are not limited to, vinyl chloride, TCE, DOP, and PCB Aroclors [29, pp. 17-26; 31, pp. 21-22, 37-42; 36, pp. 19-20, 24-25; 44, pp. 3, 7; 63, pp. 1-8; 67, pp. 1-12].

SITE SUMMARY

Recent investigations have focused on the transport of PCB Aroclors and component congeners in ground water to the west of the Jard property and the impact on residential surface soils, wetland sediments, drinking water supply wells, and residential indoor air [63, pp. 1-3, 6-8; 64; 65, pp. 11-36, 42-49, 52-61; 66, pp. 22-33; 67, pp. 1-12; 68, pp. 1-22; 69, pp. 1-3, 13-19; 80, pp. 1-3].

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Name of source: Former Facility Source

Number of source: Source No. 1

Source Type: Contaminated Soil

Description and Location of Source (with reference to a map of the site):

The Former Facility Source (Contaminated Soil – Source No. 1) is located on the Jard property (see Figures 2 and 3B). The geographic coordinates of the Former Facility Source, as measured from its approximate center, are 42° 53' 21.4" north latitude and 73° 11' 21.8" west longitude (see Figures 1 and 2) [5]. Source No. 1 constitutes the area around and beneath the former facility building, which was used in the manufacture of PCB-containing capacitors [31, pp. 5, 8; 39, p. 15]. Investigations on the Jard property have indicated the presence of PCB-contaminated soils in areas both around and below the former building footprint [30, pp. 14-16, 18, 20-21, 28-29, 33, 36-37, 70-95, 119-137; 31, pp. 8-9, 14, 16-18, 31-33, 35, 112, 117-128, 142-143, 145-147; 65, pp. 12-13, 16, 19, 43, 52]. Prior to the razing of the Former Facility Building, the topography of the Jard property was generally level to the east and south of the former building, level to slightly hummocky to the north of the building, and sloping moderately away from the building on its western side, with a small seasonal drainage swale trending along the northwestern portion of the property and continuing northwest along Bowen Road [30, p. 5; 31, p. 7]. In addition, a berm of variable height, comprised of dredged river channel material, was located in the wooded area on the southern portion of the Jard property, along the northern bank of the Roaring Branch [31, p. 46]. This berm was reportedly constructed to prevent encroachment of the Roaring Branch on properties on the north side of the river, but also served to inhibit overland flow from the site sources from directly entering the river [31, p. 46].

Soil samples collected and analyzed for PCBs throughout the developed and undeveloped former facility areas, including beneath the facility building, around the facility building, and around the larger undeveloped wooded areas extending south to the Roaring Branch of the Walloomsac River and east and west to the adjacent properties, reveal widespread PCB contamination of the sub-slab soils, and exterior surface and deep (2.5 to 5.0 feet bgs) soils at various locations, including the area extending south to the Roaring Branch and west to adjacent properties (ball fields) [31, pp. 5, 7, 43, 137 -138, 142-143, 145-147]. Removal actions have been conducted on the Jard property to address some areas of contaminated soil; however, areas of PCB-contaminated soil have been left in place [39, pp. 62-63, 66; 42, pp. 2-3; 43, pp. 1-2, 9; 62, pp. 24, 84-85]. In 2007, a permeable earthen cover was constructed over the former facility building footprint to limit human contact with contaminated soils; however, subsequent sampling has indicated that contamination is still present below the cover and in areas throughout the Jard property [10, p. 57-60, 72, 214-239; 62, pp. 15-18, 40-43; 65, pp. 12-20, 43, 52; 70, pp. 2-3; 71, pp. 1-2]. After the demolition of the building superstructure and the disposal of PCB-contaminated soil “hot spots” beneath portions of the building slab, as part of the 2006 EPA Removal Action, EPA determined that soils and portions of the concrete slab that remained have lower, but actionable levels of PCB contamination [71, p. 1]. These areas remained on site but were covered with the permeable earthen cap designed to address the potential hazard of normal human and environmental contact with the contaminated materials remaining on site [71, pp. 1-2].

In 2010, a stream restoration project was completed along the reach of the river adjacent the Jard facility, a component of which included the excavation of the berm (levee) and construction of a new berm closer to the facility building [65, pp. 10, 25, 52]. The berm along the Roaring Branch was previously located approximately 90 feet north of the northern edge of the river, but the new berm was constructed closer to the Jard facility

(approximately 40 feet farther north), to allow the river to access more of the historical floodplain and reduce future flood damage [65, p. 10]. PCB sampling results of the area extending south of the Jard facility to the Roaring Branch, including the area of soil material excavated during the 2010 river restoration project, indicate PCB contamination consistent with the release of PCBs from the Jard operations [14, pp. 1-4, 7; 16; 65, pp. 10, 52, 145, 146]. The excavated soil material was removed from the southern portion of the facility and piled in an area east of the facility building, comprising Source No. 2 (discussed further below) [4, p. 2; 14, pp. 1-3]. Since the documentation of the specific locations of samples with elevated levels of PCB-contaminated soils collected during previous investigations are limited, and due to the fact that some portion of this material may have been relocated to Source No. 2, the boundaries of Source No. 1 are based on samples collected and analyzed as part of the 2013 EPA investigation, following completion of the stream restoration activities. Based on global positioning system (GPS) documentation of samples collected to characterize the Former Facility Source (Source No. 1), the estimated area of contaminated soil is 106,943 square feet (ft²) [13].

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

- Background Concentrations:

Source No. 1 is a contaminated soil source type; therefore, background soil samples have been presented to show that the soil contamination is above background levels. On 12, 15, and 18 April 2013, as part of the EPA SR and in accordance with the EPA-approved February 2013 Site-Specific Quality Assurance Project Plan (QAPP), background soil sampling activities were conducted [4, pp. 44-54, 67; 9, pp. 1, 24, 32-37; 10, pp. 33-35, 45, 78, 206-209]. Ten background soil samples, collected from a residential property north of the Jard property, are presented to document the range of natural background conditions in the local vicinity of the site. The 10 background soil samples were collected in the vicinity of the site, during the same time period, and using similar collection and analytical methods as the soil/source samples presented as part of the Source No. 1 characterization (see Figure 3A) [10, pp. 69, 78, 133, 135, 137-138, 140, 141; 11, pp. 11, 17; 15, pp. 28, 32, 41-42, 44-46, 73-74, 82, 116, 125-126; 19, pp. 292-293, 297, 299, 307-309, 314, 316, 322; 78].

Table 1 – Background Sample Description		
Sample ID	Sample Description	Reference
P020-SS-01A (A4B95)	Moist, dark brown, SILT, some organics, trace fine to coarse sand, trace fine gravel, trace clay.	19, p. 292
P020-SS-01B (A4B97)	Dark brown, SILT, little clay, trace fine to coarse sand, trace fine gravel, trace organics.	19, p. 293
P020-SS-03A (A4B91)	Brown, SILT and fine to coarse SAND, trace fine to medium gravel, trace organics, trace clay.	19, p. 297
P020-SS-04A (A4B90)	Brown to dark brown, SILT, some fine to coarse sand, little fine to medium gravel, trace organics.	19, p. 299
P020-SS-07B (A4B92)	Brown to dark brown, fine to medium SAND and SILT, little clay, trace organics, trace coarse sand.	19, p. 307
P020-SS-07C (A4B93)	Wet, brown to dark brown, SILT, some clay, little fine sand, trace medium to coarse sand, trace organics, trace fine to medium gravel.	19, p. 308
P020-SS-08A (A4B94)	Brown, SILT and CLAY, little organics, trace fine to medium sand, trace fine gravel.	19, p. 309
P020-SS-09C (A4B98)	Brown, fine to medium GRAVEL and fine to medium SAND, little silt, trace clay, trace organics.	19, p. 314

Table 1 – Background Sample Description		
P020-SS-10B (A4B96)	Brown to yellow brown, SILT and fine SAND, little clay, trace medium to coarse sand, trace fine gravel, trace organics.	19, p. 316
P020-SS-15A (A4C37)	Brown, CLAY and fine to medium SAND, some silt, trace coarse sand, trace fine to medium gravel, trace organics.	19, p. 322

As presented in Table 1, the 10 background soil samples contained varying compositions of naturally occurring native matrix materials (i.e., sand, silt, clay, gravel, and organic matter), which constituted major and/or minor components of the sample [19, pp. 292, 293, 297, 299, 307-309, 314, 316, 322]. Similarly, the soil/source samples presented as part of the Source No. 1 characterization exhibited varying compositions of the same naturally occurring native matrix materials (see Soil/Source Samples presented below) [78]. The analytical results of each Source No. 1 soil/source sample were compared to the contaminant concentrations detected only in those background soil sample(s) which displayed the most similar matrix composition.

The 10 background soil samples were submitted to a Contract Laboratory Program (CLP) laboratory (Chemtech Consulting Group) for analysis of low/medium Aroclor compounds following Statement of Work (SOW) SOM1.2, and the data were validated at the Tier II level by personnel not involved with the background/source sampling event and according to Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses and the USEPA CLP National Functional Guidelines for Superfund Organic Method [4, pp. 44-54, 67; 11, pp. 11, 17; 19, pp. 292, 293, 297, 299, 307-309, 314, 316, 322; 77, pp. 1-4; 9; 79, pp. 1-4, 9-10]. As part of this HRS Documentation Record and the evaluation of background concentrations, the following hazardous substance in background surface soil samples is presented: Aroclor 1242 (PCBs).

Among all 10 background soil samples, PCBs (analyzed as Aroclor 1242) were not detected above the laboratory reporting limits; and the highest sample-adjusted Contract Required Quantitation Limit (CRQL) was 62 micrograms per kilogram ($\mu\text{g/Kg}$) in sample P021-SS-01A (A4B95) [79, p. 10; 87, pp. 1-2, 9, 101].

Table 2 - Background Concentration of Hazardous Substance						
Sample ID (CLP No.)	Sample Type	Date	Hazardous Substance	Hazardous Substance Concentration ($\mu\text{g/Kg}$)	Sample- Adjusted CRQL ($\mu\text{g/Kg}$)	Reference
P020-SS-01A (A4B95)	Soil	4/12/2013	PCBs (Aroclor 1242)	62 U	62	19, p. 292; 79, p. 10; 87, pp. 1-2, 9, 101
P020-SS-01B (A4B97)	Soil	4/12/2013	PCBs (Aroclor 1242)	46 U	46	19, p. 293; 79, p. 10; 87, pp. 1-2, 9, 103
P020-SS-03A (A4B91)	Soil	4/15/2013	PCBs (Aroclor 1242)	42 U	42	19, p. 297; 79, p. 9; 87, pp. 1-2, 8, 97
P020-SS-04A (A4B90)	Soil	4/15/2013	PCBs (Aroclor 1242)	41 U	41	19, p. 299; 79, p. 9; 87, pp. 1-2, 8, 96
P020-SS-07B (A4B92)	Soil	4/15/2013	PCBs (Aroclor 1242)	42 U	42	19, p. 307; 79, p. 9; 87, pp. 1-2, 8, 98
P020-SS-07C (A4B93)	Soil	4/15/2013	PCBs (Aroclor 1242)	41 U	41	19, p. 308; 79, p. 9; 87, pp. 1-2, 8, 99
P020-SS-08A (A4B94)	Soil	4/12/2013	PCBs (Aroclor 1242)	52 U	52	19, p. 309; 79, p. 9; 87, pp. 1-2, 8, 100

Table 2 - Background Concentration of Hazardous Substance						
P020-SS-09C (A4B98)	Soil	4/15/2013	PCBs (Aroclor 1242)	38 U	38	19, p. 314; 79, p. 10; 87, pp. 1-2, 9, 104
P020-SS-10B (A4B96)	Soil	4/15/2013	PCBs (Aroclor 1242)	42 U	42	19, p. 316; 79, p. 10; 87, pp. 1-2, 9, 102
P020-SS-15A (A4C37)	Soil	4/18/2013	PCBs (Aroclor 1242)	48 U	48	19, p. 322; 77, p. 9; 86, pp. 1-2, 8, 107

U = The value was non-detected [77, p. 9; 79, pp. 9-10].

CRQL = Contract-required Quantitation Limit is the substance specific level that a Contract Laboratory Program (CLP) laboratory must be able to routinely and reliably detect. Used here, the CRQL has been adjusted per the CLP Scope of Work SOM01.2 and represents a sample specific quantitation limit [1, pp. 51585, 51589; 77; 79; 86; 87]

- Soil/Source Samples:

On 1, 4, and 8 April 2013, as part of the EPA SR and in accordance with the EPA-approved February 2013 Site-Specific QAPP, soil/source sampling activities for Source No. 1 were conducted [4, pp. 5-7, 13-18, 21-26; 9, pp. 1, 21, 25-27; 10, pp. 13-15, 19-20, 22-25, 52-54, 72]. As part of the Source No. 1 characterization, 19 soil/source samples were collected from the Jard property in the area of the former building footprint (see Figure 3B) [4, pp. 5-7, 13-18, 21-26; 10, pp. 13-15, 19-20, 22-25, 52-54, 72, 133, 135, 137-138, 140-141, 148-150, 154, 156, 160-161]. The 19 soil/source samples were collected from locations on the Jard property, during the same time period, and using the same collection and analytical methods as the 10 background soil samples presented as part of the Source No. 1 characterization [10, pp. 72, 133, 135, 137-138, 140, 141; 11, pp. 4, 6-7, 11, 17; 15, pp. 28, 32, 41-42, 44-46, 73-74, 82, 116, 125 -126; 19, pp. 292 -293, 297, 299, 307 -309, 314, 316, 322]. Soil/source samples collected from Source No. 1 were of similar composition to the native materials described in the background soil samples presented for Source No. 1 (see Tables 1 and 3) [78]. Table 3 provides the matrix descriptions for the samples which define the contaminated soil source.

Table 3 – Source No. 1 Sample Description		
Sample ID	Sample Description	Reference
SB-01C (A4B17)	Gray, fine SAND and SILT, little fine to coarse gravel. An oil staining was noted.	10, pp. 133, 164
SB-03B (A4B18)	Dark gray, fine to coarse SAND and SILT, some medium to coarse gravel (red rock fragments, possibly brick).	10, pp. 135, 164
SB-05B (A4B19)	Wet, brown to dark brown, fine SAND and SILT, trace medium to coarse sand, trace fine gravel.	10, pp. 137, 165
SB-06B (A4B20)	Dark brown, fine SAND and SILT, trace clay, trace fine to medium gravel, trace medium to coarse sand.	10, pp. 138, 165
SB-08D (A4B21)	Olive to gray, fine to medium GRAVEL and fine to coarse SAND, some silt, trace clay. A petroleum odor and visible sheen were noted.	10, pp. 140, 166
SB-09D (A4B22)	Wet, gray, fine to coarse SAND, some fine to coarse gravel, trace silt.	10, pp. 141, 166
SO-24A (A4B45)	Well-sorted, brown, fine SAND, little silt, trace organics, trace gravel.	15, p. 28

Table 3 – Source No. 1 Sample Description		
SO-25B (A4B46)	Brown, SILT, little fine to medium sand, trace clay, trace organics, trace coarse sand.	15, p. 32
SO-28A (A4B47)	Brown, fine to coarse SAND, little silt, trace fine gravel, trace organics.	15, p. 41
SO-29A (A4B48)	Brown, fine to coarse SAND and SILT, little fine gravel, trace organics, trace clay.	15, p. 42
SO-30B (A4B51)	Brown to dark gray, SILT and fine SAND, trace medium to coarse sand, trace fine to medium gravel, trace organics, trace clay.	15, p. 44
SO-31A (A4B49)	Brown, fine SAND and SILT, trace medium to coarse sand, trace fine to medium gravel, trace organics, trace clay.	15, p. 45
SO-31B (A4B50)	Brown, SILT and fine SAND, little fine to medium gravel, trace medium to coarse sand, trace organics, trace clay.	15, p. 46
SO-52A (A4B41)	Wet, dark brown, CLAY and SILT, little fine to coarse sand, trace fine gravel, trace organics.	15, p. 73
SO-53A (A4B42)	Brown, SILT and fine to coarse SAND, little fine to medium gravel, trace organics, trace clay.	15, p. 74
SO-61A (A4B40)	Brown, SILT, some fine to coarse sand, trace fine gravel, trace organics, trace clay.	15, p. 82
SO-85C (A4B44)	Brown, SILT and fine to coarse SAND, little fine to medium gravel, trace organics, trace clay.	15, p. 116
SO-91A (A4B43)	Brown SILT, some fine to coarse sand, trace fine gravel, trace organics, trace clay.	15, p. 125
SO-92A (A4B39)	Dark brown, SILT, little fine to coarse sand, little organics, trace clay, trace fine to medium gravel.	15, p. 126

The 19 soil/source samples were submitted to a CLP laboratory (Chemtech Consulting Group) for analysis of low/medium Aroclor compounds following SOW SOM1.2, and the data were validated at the Tier II level by personnel not involved with the source sampling event and according to Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses and the USEPA CLP National Functional Guidelines for Superfund Organic Methods [4, pp. 5-7, 13-18, 21-26; 10, pp. 133, 135, 137-138, 140-141; 11, pp. 4, 6-7; 15, pp. 28, 32, 41-42, 44-46, 73-74, 82, 116, 125-126; 72, pp. 1-5, 10; 73, pp. 1-6, 10-12].

Among the 19 soil/source samples, PCBs (analyzed as Aroclor 1242) were detected at a maximum concentration of 4,800,000 µg/Kg in soil/source sample SB-03B (A4B18) (see Table 4) [72, p. 10]. Based on chemical analysis of soil/source samples collected during the EPA SR, Source No. 1 has been documented to contain PCBs (analyzed as Aroclor 1242), which is defined as a hazardous substance according to the HRS [1, p. 51586]. PCBs (analyzed as Aroclor 1242), were detected in Source No. 1 soil/source samples at concentrations significantly above background concentrations [72, p. 10; 73, pp. 10-12; 77, p. 9; 79, pp. 9-10]. Therefore, PCBs (analyzed as Aroclor 1242), are considered to be associated with Source No. 1 [1, p. 51588 (Section 2.2.2)].

Table 4 - Concentration of Hazardous Substance Associated with Source No. 1

Sample ID (CLP No.)	Sample Type	Date	Hazardous Substance	Hazardous Substance Concentration (µg/Kg)	Sample- Adjusted CRQL (µg/Kg)	Reference
SB-01C (A4B17)	Soil/ Source	4/1/2013	PCBs (Aroclor 1242)	280,000*	39,000*	10, p. 133; 72, p. 10; 81, pp. 1-2, 8, 72-73
SB-03B (A4B18)	Soil/ Source	4/1/2013	PCBs (Aroclor 1242)	4,800,000*	71,000*	10, p. 135; 72, p. 10; 81, pp. 1-2, 8, 74-75
SB-05B (A4B19)	Soil/ Source	4/8/2013	PCBs (Aroclor 1242)	820*	73*	10, p. 137; 72, p. 10; 81, pp. 1-2, 8, 76-77
SB-06B (A4B20)	Soil/ Source	4/8/2013	PCBs (Aroclor 1242)	1,900*	360*	10, p. 138; 72, p. 10; 81, pp. 1-2, 8, 78-79
SB-08D (A4B21)	Soil/ Source	4/8/2013	PCBs (Aroclor 1242)	730,000*	72,000*	10, p. 140; 72, p. 10; 81, pp. 1-2, 8, 80-81
SB-09D (A4B22)	Soil/ Source	4/8/2013	PCBs (Aroclor 1242)	40,000*	3,600*	10, p. 141; 72, p. 10; 81, pp. 1-2, 8, 82-83
SO-24A (A4B45)	Soil/ Source	4/4/2013	PCBs (Aroclor 1242)	1,100*	360*	15, p. 28; 73, p. 11; 82, pp. 1-2, 8, 87-88
SO-25B (A4B46)	Soil/ Source	4/4/2013	PCBs (Aroclor 1242)	2,000*	390*	15, p. 32; 73, p. 11; 82, pp. 1-2, 8, 89-90
SO-28A (A4B47)	Soil/ Source	4/4/2013	PCBs (Aroclor 1242)	1,000* J	360*	15, p. 41; 73, p. 11; 82, pp. 1-2, 8, 91-92
SO-29A (A4B48)	Soil/ Source	4/4/2013	PCBs (Aroclor 1242)	1,800*	360*	15, p. 42; 73, p. 11; 82, pp. 1-2, 8, 93-94
SO-30B (A4B51)	Soil/ Source	4/4/2013	PCBs (Aroclor 1242)	7,300*	3,800*	15, p. 44; 73, p. 12; 82, pp. 1-2, 9, 99-100
SO-31A (A4B49)	Soil/ Source	4/4/2013	PCBs (Aroclor 1242)	1,100*	180*	15, p. 45; 73, p. 11; 82, pp. 1-2, 8, 95-96
SO-31B (A4B50)	Soil/ Source	4/4/2013	PCBs (Aroclor 1242)	3,500*	390*	15, p. 46; 73, p. 12; 82, pp. 1-2, 9, 97-98
SO-52A (A4B41)	Soil/ Source	4/4/2013	PCBs (Aroclor 1242)	630* J	480*	15, p. 73; 73, p. 10; 82, pp. 1-2, 7, 80-81
SO-53A (A4B42)	Soil/ Source	4/4/2013	PCBs (Aroclor 1242)	700* J	370*	15, p. 74; 73, p. 10; 82, pp. 1-2, 7, 82-83
SO-61A (A4B40)	Soil/ Source	4/4/2013	PCBs (Aroclor 1242)	1,200*	200*	15, p. 82; 73, p. 10; 82, pp. 1-2, 7, 78-79
SO-85C (A4B44)	Soil/ Source	4/8/2013	PCBs (Aroclor 1242)	1,200*	200*	15, p. 116; 73, p. 11; 82, pp. 1-2, 8, 85-86
SO-91A (A4B43)	Soil/ Source	4/8/2013	PCBs (Aroclor 1242)	110	38	15, p. 125; 73, p. 11; 82, pp. 1-2, 8, 84
SO-92A (A4B39)	Soil/ Source	4/8/2013	PCBs (Aroclor 1242)	1,100*	420*	15, p. 126; 73, p. 10; 82, pp. 1-2, 7, 76-77

- J = The value is estimated [72, p. 10; 73, pp. 10 -12]. The qualified data are estimated due to elevated percent difference between the gas chromatograph columns, which represents an unknown bias [136]. For this reason, EPA has evaluated the possible impact of this bias on the association of the “J” qualified substances, using the EPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination* [136; 137]. While this fact sheet was not developed for adjusting qualified source data, if the “J” qualified source data were adjusted per this EPA guidance to reflect the possible impact of the bias on the contaminant concentration, as a check to ensure the substance was present at a concentration above that in the native soil, three samples would no longer qualify as source samples[136, 137]. However, omission of the three “J” qualified samples presented above would only slightly change the size of the contaminated soil, Source No. 1, and the number of hazardous substances associated with the source would not be reduced.
- * = Reported value is from a diluted analysis. [72, p. 10; 73, pp. 10-12].
- CRQL = Contract-Required Quantitation Limit is the substance-specific level that a Contract Laboratory Program (CLP) laboratory must be able to routinely and reliably detect. Used here, the CRQL has been adjusted per the CLP Scope of Work SOM01.2 and represents a sample-specific quantitation limit [1, pp. 51585, 51589; 72; 73].

List of Hazardous Substances Associated with Source

PCBs (analyzed as Aroclor 1242)

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Observations indicated that no portion of Source No. 1 has a maintained engineered cover or complete run-on and run-off control management systems [4, p. 24; 10, pp. 133, 135, 137-138, 140, 142; 15, pp. 28, 32, 41-42, 44-46, 73-74, 82, 116, 125-126]. An earthen cover was installed over the former building footprint in 2007 to limit human contact; however, this cap was not constructed to be impermeable [70, pp. 2-3; 71, pp. 1-2]. In addition, portions of the contaminated soil source are outside of the capped area and remain uncovered (see Figure 3B) [70, pp. 2-3; 71, pp. 1-2]. No report of a natural or man-made liner was documented during source sampling activities [4, p. 24; 10, pp. 133, 135, 137-138, 140, 142; 15, pp. 28, 32, 41-42, 44-46, 73-74, 82, 116, 125-126]. Therefore, Source No. 1 does not have full containment, and the source yields a containment value of 10 [1, p. 51596 (Table 3-2)].

Table 5 - Hazardous Substances Available to Ground Water Pathway and Ground Water to Surface Water Component of Surface Water Pathway		
Containment Description	Containment Factor	References
Release to ground water: Based on the lack of a liner, a maintained engineered cover, and any complete run-on and run-off control management systems, a Containment Factor Value of 10 has been assigned for release to the Ground Water Migration Pathway and Surface Water Migration Pathway (Ground Water to Surface Water component) for Source No. 1.	10	4, p. 24; 10, pp. 133, 135, 137-138, 140, 142; 15, pp. 28, 32, 41-42, 44-46, 73-74, 82, 116, 125-126

2.4.2 HAZARDOUS WASTE QUANTITY

2.4.2.1 Hazardous Waste Quantity

The Hazardous Waste Quantity for Source No. 1 was assigned based on the Area Factor Value of a “contaminated soil” source type [1, p. 51591 (Table 2-5, Section 2.4.2.1.4)]. The Hazardous Constituent Quantity, Hazardous Wastestream Quantity, and Volume values were not evaluated for Source No. 1 because insufficient information was available, as described in the sections below [1, pp. 51590-51591 (Sections 2.4.2.1.1, 2.4.2.1.2, and 2.4.2.1.3, Table 2-5)].

2.4.2.1.1 Hazardous Constituent Quantity

Description

The Hazardous Constituent Quantity for Source No. 1 could not be adequately determined according to the HRS requirements; that is, the total mass of all Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substances in the source and releases from the source is not known and cannot be estimated with reasonable confidence [1, pp. 51590-51591 (Section 2.4.2.1.1)]. Insufficient historical and current data [manifests, potentially responsible party (PRP) records, State records, permits, waste concentration data, etc.] are available to adequately calculate the total mass of all CERCLA hazardous substances in the source and the associated releases from the source. Therefore, there is insufficient information to calculate the total Hazardous Constituent Quantity for Source No. 1 with reasonable confidence.

Hazardous Constituent Quantity Assigned Value: Not Scored

2.4.2.1.2 Hazardous Wastestream Quantity

Description

The Hazardous Wastestream Quantity for Source No. 1 could not be adequately determined according to the HRS requirements; that is, the total mass of all hazardous wastestreams and CERCLA pollutants and contaminants for the source and releases from the source is not known and cannot be estimated with reasonable confidence [1, p. 51591 (Section 2.4.2.1.2)]. Insufficient historical and current data (manifests, PRP records, State records, permits, waste concentration data, annual reports, etc.) are available to adequately calculate the total mass of all hazardous wastestreams and CERCLA pollutants and contaminants for the source and the associated releases from the source. Therefore, there is insufficient information to adequately calculate or extrapolate the total or a partial Hazardous Wastestream Quantity for Source No. 1 with reasonable confidence.

Sum of Wastestream Quantity/5,000 [1, p. 51591 (Table 2-5)]: Not Scored

Hazardous Wastestream Quantity Assigned Value: Not Scored

2.4.2.1.3 Volume

Description

The volume for Source No. 1 could not be adequately determined according to the HRS requirements because insufficient historical and current waste sampling data are available to adequately calculate the volume of the source with reasonable confidence [1, p. 51591 (Section 2.4.2.1.3)]. Insufficient historical or current sampling

data are available to adequately estimate the depth of waste material within the source. Therefore, there is insufficient information to adequately calculate or estimate the volume for Source No. 1.

Volume Assigned Value: 0

2.4.2.1.4 Area

Description

Based on sampling results and observations of the contaminated soil material contained within Source No. 1, the areal extent of the source was documented using GPS and by connecting the sample locations presented in Table 4 (see Figure 3B) [4, p. 6; 13, p. 1]. Based on the information recorded as part of the EPA SR, the area of the Former Facility Source (Source No. 1) was determined to be approximately 106,943 ft² (see Figure 3B) [4, p. 6; 13, p. 1].

Table 6 - Area		
Source Type	Units (ft ²)	References
Contaminated Soil	106,943	4, p. 6; 13

Sum (ft²): 106,943

Equation for Assigning Value [1, p. 51591 (Table 2-5)]: $\text{Area}/34,000 = 106,943/34,000$

Area Assigned Value: 3.14

2.4.2.1.5 Source Hazardous Waste Quantity Value

Highest assigned value assigned [1, p. 51591 (Table 2-5)]: 3.14

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Name of source: Excavated Material Pile

Number of source: Source No. 2

Source Type: Pile

Description and Location of Source (with reference to a map of the site):

The Excavated Material Pile (Pile – Source No. 2) is located on the Jard property (see Figures 2 and 3B). The geographic coordinates of the Excavated Material Pile, as measured from its approximate center, are 42° 53' 20.3" north latitude and 73° 11' 18.0" west longitude (see Figures 1 and 2) [5]. Source No. 2 comprises the material which was excavated from the southern portion of the Jard property during a 2010 river restoration project [14, pp. 1-4, 7; 16; 65, pp. 10, 52]. Prior to the razing of the Former Facility Building, the topography of the Jard property was generally level to the east and south of the former building, level to slightly hummocky to the north of the building, and sloping moderately away from the building on its western side, with a small seasonal drainage swale trending along the northwestern portion of the property and continuing northwest along Bowen Road [30, p. 5; 31, p. 7]. In addition, a berm of variable height, comprised of dredged river channel material, was located in the wooded area on the southern portion of the Jard property, along the northern bank of the Roaring Branch [31, p. 46]. This berm was reportedly constructed to prevent encroachment of the Roaring Branch on properties on the north side of the river, but also served to inhibit overland flow from the "pile" from directly entering the river [31, p. 46]. During investigations prior to the 2010 river restoration project, soil samples collected and analyzed for PCBs throughout the developed and undeveloped former facility areas revealed widespread PCB contamination of the sub-slab soils, and exterior surface and deep (2.5 to 5.0 feet bgs) soils at various locations, including the area extending south to the Roaring Branch [31, pp. 5, 7, 43, 52, 135, 137-138, 142-143, 145-147]. The 2010 stream restoration project was completed along the reach of the river adjacent to the Jard facility, a component of which included the excavation of the berm (levee) and construction of a new berm closer to the facility building [65, pp. 10, 25, 52]. The berm along the Roaring Branch was previously located approximately 90 feet north of the northern edge of the river, but the new berm was constructed closer to the Jard facility (approximately 40 feet farther north), as part of a floodplain restoration project to allow the river to access more of the historical floodplain and to reduce future flood damage [65, p. 10]. PCB sampling results of the area extending south of the Jard facility to the Roaring Branch, including the area of soil material excavated during the 2010 river restoration project, indicate PCB contamination consistent with the release of PCBs from the Jard operations and that the PCB contamination in this area was previously contiguous with Source No. 1 [14, pp. 1-4, 7; 16; 65, pp. 10, 52, 145, 146]. The excavated soil material was removed from the southern portion of the facility and piled in an area east of the facility building, comprising Source No. 2 [4, p. 2; 14, pp. 1-3]. Based on information from the Vermont Agency of Natural Resources Department of Environmental Conservation (VT ANR DEC), the engineers responsible for the work stockpiled the soils from the southern boundary of the Jard property on the eastern portion of the Jard property [4, p. 2; 14, pp. 1-3]. Approximately 33,250 cubic yards (yd³) of material originating from the southern portion of the Jard property are staged in the Excavated Material Pile [14, pp. 1-4].

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

- Source Samples:

On 3 and 4 April 2013, as part of the EPA SR and in accordance with the EPA-approved February 2013 Site-Specific QAPP, source sampling activities for Source No. 2 were conducted [4, pp. 11-18; 9, pp. 1, 21, 25-27; 10, pp. 18-19, 52-54, 72; 15, pp. 6, 16, 25-26, 51, 53, 65-66, 78, 83]. As part of the Source No. 2 characterization, 10 source samples are presented which were collected from various locations throughout the pile (see Figure 3B) [4, pp. 11-18; 10, pp. 18-19, 52-54, 72, 144, 146-147, 151, 153, 155-156]. Table 7 provides the matrix descriptions for the samples which define the pile source.

Table 7 – Source No. 2 Sample Description		
Sample ID	Sample Description	Reference
SO-06A (A4B23)	Brown, SILT, some fine to coarse sand, little fine gravel, trace organics, trace clay.	15, p. 6
SO-14A (A4B25)	Brown, SILT and fine to coarse SAND, little fine to coarse gravel, trace organics.	15, p. 16
SO-21A (A4B27)	Brown, fine SAND and SILT, little fine to medium gravel, trace organics, trace medium to coarse sand.	15, p. 25
SO-22A (A4B28)	Olive brown, SILT and fine to coarse SAND, little clay, little fine to medium gravel, trace organics (rootlets).	15, p. 26
SO-34A (A4B30)	Brown, fine to coarse SAND and SILT, little fine to medium gravel, trace clay, trace organics.	15, p. 51
SO-36A (A4B31)	Brown, fine to coarse SAND and SILT, trace fine to medium gravel, trace clay, trace organics.	15, p. 53
SO-45A (A4B36)	Brown, fine to coarse SAND and SILT, trace fine to medium gravel, trace organics.	15, p. 65
SO-46A (A4B32)	Dark brown, SILT and fine to coarse SAND, trace fine to medium gravel, trace organics.	15, p. 66
SO-57A (A4B38)	Dark brown, SILT, little organics, trace fine to coarse sand, trace fine to medium gravel, trace clay.	15, p. 78
SO-62A (A4B33)	Brown, fine to coarse SAND and SILT, little fine to medium gravel, trace organics, trace clay.	15, p. 83

The 10 source samples were submitted to a CLP laboratory (Chemtech Consulting Group) for analysis of low/medium Aroclor compounds following SOW SOM1.2, and the data were validated at the Tier II level by personnel not involved with the source sampling event and according to Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses and the USEPA CLP National Functional Guidelines for Superfund Organic Methods [4, pp. 11-18; 11, pp. 4-5, 7; 15, pp. 6, 16, 25-26, 51, 53, 65-66, 78, 83; 72, pp. 1-5, 9, 11; 73, pp. 1-6, 10].

Among the 10 source samples, PCBs (analyzed as Aroclor 1242) were detected at a maximum concentration of 1,600 µg/Kg in source sample SO-36A (A4B31) (see Table 8) [72, p. 11]. Based on chemical analysis of soil/source samples collected during the EPA SR, Source No. 2 has been documented to contain PCBs (analyzed as Aroclor 1242), which is defined as a hazardous substance according to the HRS [1, p. 51586]. Therefore, the

hazardous substance PCBs (analyzed as Aroclor 1242) is considered to be associated with Source No. 2 [1, p. 51588 (Section 2.2.2)].

Table 8 - Concentration of Hazardous Substance Associated with Source No. 2						
Sample ID	Sample Type	Date	Hazardous Substance	Hazardous Substance Concentration (µg/Kg)	Sample-Adjusted CRQL (µg/Kg)	Reference
SO-06A (A4B23)	Source	4/3/2013	PCBs (Aroclor 1242)	150 J	39	15, p. 6; 72, p. 11; 81, pp. 1-2, 9, 84
SO-14A (A4B25)	Source	4/3/2013	PCBs (Aroclor 1242)	120	37	15, p. 16; 72, p. 9; 81, pp. 1-2, 7, 86
SO-21A (A4B27)	Source	4/3/2013	PCBs (Aroclor 1242)	110 J	36	15, p. 25; 72, p. 9; 81, pp. 1-2, 7, 88
SO-22A (A4B28)	Source	4/3/2013	PCBs (Aroclor 1242)	140	36	15, p. 26; 72, p. 9; 81, pp. 1-2, 7, 89
SO-34A (A4B30)	Source	4/4/2013	PCBs (Aroclor 1242)	320	37	15, p. 51; 72, p. 11; 81, pp. 1-2, 9, 91
SO-36A (A4B31)	Source	4/4/2013	PCBs (Aroclor 1242)	1,600*	390*	15, p. 53; 72, p. 11; 81, pp. 1-2, 9, 92-93
SO-45A (A4B36)	Source	4/4/2013	PCBs (Aroclor 1242)	350 J	38	15, p. 65; 73, p. 10; 82, pp. 1-2, 7, 73
SO-46A (A4B32)	Source	4/4/2013	PCBs (Aroclor 1242)	1,200*	370*	15, p. 66; 72, p. 11; 81, pp. 1-2, 9, 94-95
SO-57A (A4B38)	Source	4/4/2013	PCBs (Aroclor 1242)	250	45	15, p. 78; 73, p. 10; 82, pp. 1-2, 7, 75
SO-62A (A4B33)	Source	4/4/2013	PCBs (Aroclor 1242)	180	38	15, p. 83; 72, p. 9; 81, pp. 1-2, 7, 96

J = The value is estimated [72, pp. 9, 11; 73, p. 10]. The qualified data are estimated due to elevated percent difference between the gas chromatograph columns and field duplicate precision, which represents an unknown bias; however, this quantification does not impact the identification of the presence of PCBs [136].

* = Reported value is from diluted analysis [72, p. 11].

CRQL = Contract-Required Quantitation Limit is the substance-specific level that a Contract Laboratory Program (CLP) laboratory must be able to routinely and reliably detect. Used here, the CRQL has been adjusted per the CLP Scope of Work SOM01.2 and represents a sample-specific quantitation limit [1, pp. 51585, 51589; 74].

List of Hazardous Substances Associated with Source

PCBs (analyzed as Aroclor 1242)

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Observations indicated that no portion of Source No. 2 has a maintained engineered cover or complete run-on and run-off control management systems [4, p. 19]. No report of a natural or man-made liner was documented during source sampling activities or through communications with the engineering firm responsible for the river restoration [4, p. 19; 15, pp. 6, 16, 25-26, 51, 53, 65-66, 78, 83; 16, p. 1]. Therefore, Source No. 2 does not have full containment, and the source yields a containment value of 10 [1, p. 51596 (Table 3-2)].

Table 9 - Hazardous Substances Available to Ground Water Pathway and Ground Water to Surface Water Component of the Surface Water Pathway		
Containment Description	Containment Factor	References
Release to ground water: Based on the lack of a liner, a maintained engineered cover, and any complete run-on and run-off control management systems, a Containment Factor Value of 10 has been assigned for release to the Ground Water Migration Pathway and Surface Water Migration Pathway (Ground Water to Surface Water component) for Source No. 2.	10	4, p. 19; 15, pp. 6, 16, 25-26, 51, 53, 65-66, 78, 83; 16, p. 1

2.4.2 HAZARDOUS WASTE QUANTITY

2.4.2.1 Hazardous Waste Quantity

The Hazardous Waste Quantity for Source No. 2 was assigned based on the Volume Assigned Value of a “pile” source type [1, p. 51591, Table 2-5, Section 2.4.2.1.3]. The Hazardous Constituent Quantity and Hazardous Wastestream Quantity Values were not evaluated for Source No. 2 because insufficient information was available, as described in the sections below [1, pp. 51590-51591 (Sections 2.4.2.1.1 and 2.4.2.1.2, Table 2-5)]

2.4.2.1.1 Hazardous Constituent Quantity

Description

The Hazardous Constituent Quantity for Source No. 2 could not be adequately determined according to the HRS requirements; that is, the total mass of all CERCLA hazardous substances in the source and releases from the source is not known and cannot be estimated with reasonable confidence [1, pp. 51590-51591 (Section 2.4.2.1.1)]. Insufficient historical and current data (manifests, PRP records, State records, permits, waste concentration data, etc.) are available to adequately calculate the total mass of all CERCLA hazardous substances in the source and the associated releases from the source. Therefore, there is insufficient information to calculate the total Hazardous Constituent Quantity for Source No. 2 with reasonable confidence.

Hazardous Constituent Quantity Assigned Value: Not Scored

2.4.2.1.2 Hazardous Wastestream Quantity

Description

The Hazardous Wastestream Quantity for Source No. 2 could not be adequately determined according to the HRS requirements; that is, the total mass of all hazardous wastestreams and CERCLA pollutants and contaminants for

the source and releases from the source is not known and cannot be estimated with reasonable confidence [1, p. 51591 (Section 2.4.2.1.2)]. Insufficient historical and current data (manifests, PRP records, State records, permits, waste concentration data, annual reports, etc.) are available to adequately calculate the total mass of all hazardous wastestreams and CERCLA pollutants and contaminants for the source and the associated releases from the source. Therefore, there is insufficient information to adequately calculate or extrapolate the total or a partial Hazardous Wastestream Quantity for Source No. 2 with reasonable confidence.

Sum of Wastestream Quantity/5,000 [1, p. 51591 (Table 2-5)]: Not Scored

Hazardous Wastestream Quantity Assigned Value: Not Scored

2.4.2.1.3 Volume

Description

An estimated volume calculation was determined for Source No. 2 based on observations, as well as height measurements and perimeter area GPS data obtained in the field [4, p. 3 ; 14, pp. 1,7] . Based on height measurements and perimeter area GPS data obtained in the field, a volume estimate of 37,981 yd³ was calculated [14, pp. 1,7]. Information provided by the engineers responsible for oversight during the river restoration and creation of the pile indicated an estimated volume for Source No. 2 of approximately 33,250 yd³ [14, pp. 1-4]. Therefore, the volume estimate of 33,250 yd³ used for this HRS Documentation Record and presented below is a minimal estimate.

Table 10 - Volume			
Source Type	Description (# drums or dimensions)	Units (yd ³)	References
Pile	Volume	33,250	4, p. 3; 14, pp. 1-7

Sum (yd³): 33,250

Equation for Assigning Value [1, p. 51591 (Table 2-5)]: Volume/2.5 = 33,250/2.5

Volume Assigned Value: 13,300

2.4.2.1.4 Area

Description

Based on the HRS, if the volume of a source can be determined, the area measure of that source should not be evaluated and the area value assigned should be 0 [1, p. 51591 (Section 2.4.2.1.3)].

Area Assigned Value: 0

2.4.2.1.5 Source Hazardous Waste Quantity Value

Highest assigned value assigned [1, p. 51591 (Table 2-5)]: 13,300

SUMMARY OF SOURCE DESCRIPTIONS

Table 11 – Summary of Source Descriptions							
Source No.	Source HWQ Value	Source Hazardous Constituent Quantity Complete? (Y/N)	Containment Factor Value by Pathway				
			Ground Water (GW) (Ref. 1, Table 3-2)	Surface Water (SW)		Air	
				Overland/ flood (Ref. 1, Table 4-2)	GW to SW (Ref. 1, Table 3-2)	Gas (Ref. 1, Table 6-3)	Particulate (Ref. 1, Table 6-9)
1	3.14	N	10	NS	10	NS	NS
2	13,300	N	10	NS	10	NS	NS

HWQ = Hazardous Waste Quantity
NS = Not Scored

Total Source Hazardous Waste Quantity Value: 13,303.14

Description of Other Possible Sources:

No other possible sources have been documented on the Jard site.

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Ground Water Migration Pathway Description

The ground water migration pathway discussed in this documentation record features the generally east to west flow of PCB-contaminated ground water within the glacio-fluvial/glacio-lacustrine overburden aquifer beneath and downgradient of the Jard property. Overburden ground water monitoring wells installed on and around the Jard site indicate an aquifer comprised of glacial deposits (see below). Investigations on the Jard property and locations west of the property have documented the release of PCBs from sources to ground water and to surface water, impacting a downgradient private drinking water supply well and wetland frontage.

The Jard site is located in the Hudson-Hoosic River Watershed located between the Walloomsac River and Furnace Brook (see Figures 1 and 2) [101]. Surface topography in the vicinity of the Jard site is slight, and slopes down to the west-northwest from the Jard property to Park Street and then to Route 7 (see Figure 1) [3; 65, pp. 51, 54-55]. Regional surface topography increases steeply to the east and southwest of the Jard property, and moderately to the northwest and north [3; 96]. Investigations of the local overburden aquifer, indicate ground water from the Jard property generally flows to the northwest, parallel to the Roaring Branch of the Walloomsac River [54, pp. 2, 23-24; 65, pp. 28, 44, 57-58; 67, pp. 1, 5, 11; 68, pp. 3, 7, 19-20]. Investigations have further noted that the Roaring Branch of the Walloomsac River has been classified as a losing stream with temporal and locational exceptions [65, pp. 28, 35]. Ground water to surface water flow has also been documented downgradient of the Jard property based on piezometric data and field observations (see Surface Water Migration Pathway).

Regional and Site Geology

Bedrock Geology:

The Jard site is located in the Vermont Valley Physiographic subdivision of Vermont, between the Green Mountains to the east and the Taconic Mountains to the west [91, p. 18]. The Vermont Valley is a long, narrow lowland approximately 1 to 5 miles wide and 85 miles long, which is underlain by Cambro-Ordovician marble, dolomitic marble, quartzite, and phyllite [90, p. 7; 91, p. 22; 92]. The fabric of the topography and the rocks is generally north-south [91, p. 21].

The most conspicuous topographic feature in the Bennington area is the western margin of the Green Mountains, which rises abruptly 1,800 feet from the Vermont Valley to the west [90, p. 9]. The Taconic Range, which comprises the western margin of the Vermont Valley, also forms an abrupt topographic high [90, p. 10]. In general, the topography of the region reflects the structure and lithology of the bedrock, with the low valleys underlain by carbonate rocks and the major uplands (Green Mountains and Taconic Range) underlain by pre-Cambrian crystalline complex or younger phyllites and schists [90, p. 10].

The bedrock geology of the Bennington and Jard site area consists of an unknown thickness of Pre-Cambrian gneisses and schist overlain by approximately 10,000 feet of younger sediments consisting of Lower Cambrian to Middle or Upper Ordovician [90, p. 7]. Bedrock beneath the Jard site area has been mapped as the Winooski Dolostone of Middle Cambrian age [92, p. 2]. The Winooski Dolostone is described as a well-bedded dolostone weathering beige, cream, buff, with green, red, or gray phyllite, siliceous partings, and thin beds of blue-quartz-pebble conglomerate and quartzite [92, p. 3]. Other major bedrock units within 1 radial mile of the Jard site include the Upper Cambrian Clarendon Springs Formation (calcitic dolostone), Lower Ordovician Shelburne Marble, Lower and Middle Ordovician Bascam

Formation, Lower Cambrian Monkton Quartzite, Lower Cambrian Dunham Dolostone, Lower Cambrian Cheshire Quartzite, and Neoproterozoic Mettawee Slate Facies (mainly phyllites) [92, pp. 2 -3]. The dolostones (rocks that are primarily composed of the carbonate mineral dolomite) underlying the site are soluble, and are susceptible to dissolution [31, p. 44; 92, pp. 2-3; 95, p. 1; 105, pp. 2-3; 114, p. 1; 115, p. 1]. Dissolution of the dolostones by a weak carbonic acid solution (acidic rainwater) may create a network of interconnected karst or karst-like features, including fissures, fractures, conduits or voids, as rainwater [95, p. 1; 105, p. 2; 114, pp.1-2]. A study conducted in the 1980s on the Morgan Spring, a public drinking water supply source located approximately 0.57 miles southeast of the Jard site, concluded that the Morgan Spring sources are likely to be of karst or cavernous limestone origin and may have a lateral extent of 3 to 5 square miles [55; 56, pp. 14-17].

Major deformation in southwestern Vermont resulted from thrust faulting and folding during the Taconic Orogeny in the Ordovician [90, pp. 7-8, 12, 36]. The Jard site area is situated between two major thrust faults: the Green Mountain Frontal Thrust is located to the west, and a major unnamed thrust is located to the east [92, p. 3; 117]. In addition to these two major thrust faults, smaller thrust faults are present in this area, and at least one high-angle normal fault is also documented [90, p. 8; 92]. This normal fault occurred following the thrusting and folding, and may indicate crustal relaxation or upwarping following orogenic activity [90, p. 8]. The thrust faulting in southwestern Vermont is believed to be of two major types: deep-seated thrusts extending into the pre-Cambrian basement rocks, and surficial flat-lying thrusts affecting only Paleozoic rocks [90, p. 8]. Other major structural features in the area include the North Bennington anticline, the West Mountain and Mount Anthony synclines, the Maple Hill thrust and syncline, the North Pownal overthrust, the structural and stratigraphic complex of the Pownal Upland, and the Reservoir Brook fault [90, pp. 41 -49]. Review of previous investigations conducted in the area of the local overburden aquifer, located north and northwest of the Jard property, did not specify the presence of any faults [92, p. 2].

Bedrock monitoring wells have not been installed during any investigations conducted in the Jard site area; therefore, bedrock types and descriptions were referenced using published bedrock maps and reports, and no definitive statement regarding hydraulic connection between the overburden and bedrock aquifers can be made.

Surficial Geology:

The general north-south orientation of the topography and rock fabric in the Vermont Valley had a major influence on the advancing and retreating ice from both the northeast and northwest [91, p. 21]. Glacio-lacustrine sediment is most common in the stream valleys and the lowlands of Vermont [91, p. 33]. Drainage was restricted in the Vermont Valley during the final melting of stagnant ice, and as a result many small lakes were formed [91, p. 33]. The steep gradients and high velocities of mountain streams carried a wide range of different sizes of fragments, including large boulders, into lowland areas (valleys) [91, p. 36]. As further described below, this has been documented during boring activities in the overburden deposits in the site area, where a layer of cobble, gravel, and sand deposits was found [57; 65, pp. 17-18, 52, 54-55; 88, pp. 145-165; 108, p. 15]. Based on interpretation of previous boring logs and field notes taken during the advancement and installation of monitoring wells in the site area, it appears that the bedrock is overlain by a basal or lodgement till, followed by glacio-lacustrine fine sands, silts, and clay [57; 65, pp. 17 -18; 88, pp. 145 -165]. The glacio-lacustrine sediments are overlain by outwash deposits consisting of gravel, cobbles, and boulders with minor amounts of sand [57; 65, pp. 66-80; 88, pp. 145-165].

The earliest glaciation of Vermont (early Wisconsin Stage), known as the Bennington Glacial Stade, was the advancement of glacial ice (Bennington Glacier) across the region from the northwest, which covered all of Vermont [91, p. 61]. Till deposited by the Bennington Glacier has been identified throughout Vermont, except in the northwestern part of the state [91, p. 61]. The Bennington till has been described as dense basal or lodgement till which has been overridden by subsequent glaciation except in small areas where it forms surface till [91, p.

62]. As the Bennington Glacier retreated from the Bennington area, Lake Bascom (previously Lake Hoosic) formed in the Hoosic River Valley [91, pp. 68-69; 94, p. 2]. The lake was dammed by ice in the Hudson River Valley and drained southward through Massachusetts [91, pp. 68-70].

Glaciation during the Shelburne Glacial Stade, which followed the Bennington Glacial Stade, covered all of Vermont except for the extreme southern part of the state [91, pp. 56-57]. The Bennington area was, however, affected by ice-marginal lakes in the Vermont Valley [91, p. 57]. When the margin of the Shelburne ice stood at or near its terminal position in the Bennington area, a large lake (Lake Shaftsbury) developed in essentially the same area as that of Lake Bascom [91, pp. 95-97]. Therefore, the Jard site area was occupied by a lake during two separate Pleistocene glaciations [91, pp. 56-57, 69, 96].

Surficial soils in the vicinity of the Jard property are characterized as Hero gravelly fine sandy loam, 0 to 3% slopes [58, p. 563; 93]. The thickness of the surficial soils in the Jard site area ranges from 0 to approximately 4 feet [65, pp. 66-80; 88, pp. 145-165]. The surficial glacial deposits in the Jard site area are mapped as outwash deposits consisting of poorly sorted glacio-fluvial gravel, cobbles, and boulders [94]. Subsurface data obtained during boring advancement and monitoring well installation in the Jard site area reveal that the overburden thickness is greater than 42 feet, based on the documentation that the deepest boring was advanced 42 feet below ground surface (bgs) and bedrock was not encountered at this location [88, pp. 145-165].

The outwash deposits in the Jard site area are underlain by glacio-lacustrine bottom sediments [57; 65, pp. 66-80; 88, pp. 145-165]. The glacio-lacustrine bottom sediments encountered during boring advancement directly underlie the mapped outwash deposits, indicating that the sediments were most likely deposited during the last glacial stade during the waning of the Shelburne ice [57]. The outwash deposits, including the soil developed on them, range in thickness from 11 to 33 feet [65, pp. 66-80; 88, pp. 145-165]. The maximum thickness of the glacio-lacustrine bottom sediments encountered was 23 feet in boring EPA-105; however, all of the borings except one (EPA-107), advanced by Weston Solutions, Inc., bottomed out in these sediments [57; 88, pp. 145-165]. Therefore, the maximum thickness could not be determined. The outwash deposits encountered consisted of poorly sorted gravel, cobbles, and boulders (white, pink, tan, buff, and black quartzite and metamorphic rock fragments), fine-to-coarse sand, and silt [57; 88, pp. 145-165]. The coarse outwash deposits thicken from west to east, suggesting a provenance area to the east [57; 118]. The glacio-lacustrine bottom sediments consisted mainly of brown and gray silt, brown very fine sand, and brown and gray clay [57, p. 3; 88, pp. 145-165]. The sands and silts comprising the glacio-lacustrine bottom deposits are well-sorted and lack any structure such as cross laminations [57, p. 3; 88, pp. 145-165]. Basal or lodgement till, consisting of hard, light brown and gray, silt, coarse-to-fine gravel, and clay, was found in one boring (EPA-107), in which the fines were plastered on the coarser (gravel) fragments [57, p. 3; 88, pp. 145-165]. The till appeared dry when broken, suggesting that in this location it may form a confining layer on the bedrock surface [57, p. 3; 116, p. 2].

Aquifer Interconnection:

Bedrock monitoring wells were not installed in the Jard site area, and therefore no definitive statement regarding hydraulic connection between the overburden and bedrock aquifers can be made. Impacts to the overburden aquifer only are presented in this documentation record. The bedrock aquifer is not being scored as part of this HRS Documentation Record, and aquifer interconnections have therefore not been investigated further.

Aquifer Discontinuity:

Two major thrust faults, the Green Mountain Frontal Thrust and a major unnamed thrust, are located within the 4-mile target distance limit (TDL) [92, p. 3; 117]. In addition to these two major thrust faults, smaller thrust faults and at least one normal fault are present in this area [90, p. 8; 92]. The fabric of the topography and the rocks is generally north-south; however, the thrust faults are oriented northeast-southwest [91, p. 21;

92]. Topography and the thickness of the overburden aquifer within the 4-mile TDL varies greatly and may present a discontinuity; however, there are no known discontinuities between sources on the Jard property, background ground water sample locations, the wetland area west of Park Street, and the private residential supply well constructed in the overburden aquifer, and scored as Actual Contamination Targets in this documentation record.

Jard Overburden Aquifer Attributes

Ground water beneath the Jard site, and in the local overburden aquifer, generally flows to the northwest, parallel to the Roaring Branch of the Walloomsac River; however, there appears to be evidence of a smaller component of direction flow to the southwest, toward the Roaring Branch of the Walloomsac River [65, pp. 28, 44, 57-59; 67, pp. 1, 5, 11; 68, pp. 3, 7, 19-20]. Based on interpreted ground water contour maps, and verified by an evaluation of ground water elevation data obtained between August 2010 and March 2013, the horizontal hydraulic gradient of the ground water in the Jard site area is approximately 0.02 feet/foot and to the northwest [27; 31, pp. 37, 150; 65, p. 28; 68, p. 3]. Data collected from piezometers indicate that the Roaring Branch of the Walloomsac River exhibits characteristics of both a gaining stream and losing stream along various segments of the river; and in one location, data collected indicated that the river had gone from a losing reach to a gaining reach over a one-month period [31, pp. 22-23, 37, 150; 65, pp. 27-28]. For the time period of the study, piezometric data indicated that ground water does not discharge to the Roaring Branch of the Walloomsac River along the reach adjacent to the Jard property [31, pp. 22-23, 37, 56, 150; 65, p. 28]. The point at which ground water begins discharging to the Roaring Branch of the Walloomsac River has been documented at different locations west of the Jard property during various studies [31, pp. 37, 150; 68, pp. 2-3, 8, 19]. Ground water to surface water discharge has been documented by piezometer data collected from surface water bodies located northwest of the Jard property (Duck Pond and Greene Pond) which indicated that these surface water bodies were gaining [65, pp. 28, 45, 52-54]. Evidence of ground water to surface water discharge in this area is further supported by the observation of ground water seeps near the base of the slope above Duck Pond and within the wetland area west of Park Street [65, p. 28; 119]. A second area of ground water to surface water discharge has been identified along surface water features northwest of the Jard property, near the Plasan facility along Bowen Road [68, pp. 8, 19].

Vertical hydraulic gradients measured in July and August 2010 between four paired wells (couplets) in the Jard site area by The Johnson Company were indicative of downward ground water flow (recharge) [65, pp. 28, 54-55]. Ground water elevation data collected on 27 March 2013 from seven couplet ground water monitoring wells showed slight downward (recharge) and upward (discharge) ground water flow [28].

Table 12 - Summary of Aquifers Being Evaluated

Aquifer No.	Aquifer Name	Is Aquifer Interconnected with Upper Aquifer within 2 miles? (Y/N/NA)	Is Aquifer Continuous within 4-mile TDL? (Y/N)	Is Aquifer Karst? (Y/N)
1	Jard Local Overburden Aquifer	N/A	Y	N

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifer Being Evaluated: Jard Local Overburden Aquifer

This documentation record presents data from selected background and contaminated overburden ground water monitoring wells to document an observed release, via chemical analysis, of PCBs to the Jard Overburden Aquifer. This record also documents a release of PCBs above benchmark concentrations to one downgradient private drinking water supply well which was closed due to contamination at least partially attributable to the sources presented in this documentation record (see below). Based on the results of ground water elevation data recorded in April 2012, October 2012, and March 2013, ground water in the overburden generally flows from sources on the Jard property toward the northwest, parallel to the Roaring Branch of the Walloomsac River [54, pp. 2, 23-24; 67, pp. 1, 5, 11; 68, pp. 3, 7, 19-20].

Chemical Analysis – Ground Water

Numerous studies have included investigations into ground water contamination associated with the Jard property. Some of these more recent studies (prior to the 2013 EPA SR) involved ground water sampling conducted during the following events: a ground water investigation by Lockheed Martin Technology Services Group (Lockheed) on behalf of EPA (May 2000); a Corrective Action Feasibility Investigation (CAFI) conducted by Stone Environmental, Inc. (Stone) for VT ANR DEC (December 2005); a Limited Phase II Environmental Site Assessment (Phase II ESA) conducted by The Johnson Company on behalf of VT ANR DEC (December 2010); and two site investigations conducted by The Johnson Company for VT ANR DEC (April 2012 and October 2012) [31, pp. 1, 21, 36; 44, p. 1; 65, pp. 1, 21-22; 67, p. 1; 68, pp. 1-2]. Analytical results of ground water samples collected during these investigations consistently indicated the presence of a PCB-contaminated overburden ground water plume trending downgradient from the Jard facility building to the northwest [31, pp. 1, 36-37, 152; 44, pp. 2-3, 9; 65, pp. 11-12, 31-32, 34, 60; 67, pp. 1-2, 12; 68, pp. 3, 21-22]. The most recent investigation, which included ground water sampling from a large network of ground water monitoring wells and which achieved low laboratory analytical detection limits, documented the PCB ground water plume to extend approximately 2,000 feet downgradient (northwest) of the apparent primary source area near the southern portion of the former facility building [68, pp. 3, 21-22]. Ground water samples from a selected number of ground water monitoring and former drinking water supply wells have been presented below to document an observed release, via chemical analysis, of PCBs to the Jard Overburden Aquifer and Level I targets.

- Background Concentrations:

Between 13 and 30 August 2012, as part of an EPA Removal Program Preliminary Assessment/Site Investigation (PA/SI) for the Park Street site, New Hampshire Boring, Inc. (NHB) conducted monitoring well installation activities at locations north and northwest of the Jard property [88, pp. 1-8, 16, 22]. The Park Street PA/SI was conducted to investigate potential impacts, due to contamination associated with the Jard site, to the downgradient baseball fields, residential properties, and wetlands [88, p. 2]. As part of the Park Street PA/SI, ground water monitoring wells EPA-100 and EPA-107 were installed and screened within the overburden aquifer, at locations upgradient/crossgradient of sources on the Jard property based on ground water flow evaluations (see Figure 4) [67, p. 11; 68, pp. 19-20; 88, pp. 3, 7-8, 22, 145-146, 161-162].

In December 2010, The Johnson Company completed the Phase II ESA on behalf of VT ANR DEC [65, pp. 1, 4]. Objectives of the Phase II ESA included evaluating the off-site horizontal extent of PCB transport in ground water by installing and sampling “shallow” and “deep” ground water monitoring wells [65, pp. 11-12, 21-22].

On 4 August 2010, The Johnson Company installed ground water monitoring well MW-11 along the northeast edge of the Little League property as part of an effort to determine the northerly extent of any off-site PCB plume in shallow ground water [65, pp. 21, 52-53, 69]. Ground water monitoring well MW-11 was installed and screened within the overburden aquifer, at a location crossgradient of sources on the Jard property based on ground water flow evaluations (see Figure 4) [65, pp. 14, 23, 52-53, 69; 67, p. 11; 68, pp. 19-20].

The depths of the screened intervals of the ground water monitoring wells presented below for background comparison were determined based on elevation survey data and documentation provided in well installation/boring logs [52, pp. 2-3; 53, p. 1; 54, pp. 1-2; 65, pp. 44, 69; 68, p. 7; 88, pp. 146, 162].

Table 13 - Background Ground Water Monitoring Well Details					
Monitoring Well ID Sample ID	Location	Installation Date	Screened Interval (amsl)	Screened Interval Geology	References
EPA-100 GW-01	North of the Jard property and Bowen Road.	8/28/2012	653.33 to 648.33	Gravel, cobbles, and boulders, and sand, and silt.	4, p. 9; 54, pp. 1-2; 88, pp. 7, 22, 145-146
EPA-107 GW-02	Northwest of the Jard property, on a residential property.	8/29/2012	637.99 to 627.99	Gravel, cobbles, and boulders, and sand, and silt; extending into silt and gravel with trace clay.	4, p. 8; 10, p. 167; 54, pp. 1-2; 88, pp. 7-8, 22, 161-162
MW-11 GW-09	Northwest of the Jard property, along northeast edge of adjacent property to the west containing ball fields.	8/4/2010	665.96 to 655.96	Cobbles with gravelly sand.	4, p. 9; 10, pp. 73, 169; 54, pp. 1-2; 65, pp. 14, 52, 69

amsl = above mean sea level

On 2 April 2013, as part of the EPA SR, Superfund Technical Assessment and Response Team III (START) collected ground water samples GW-01, GW-02, and GW-09 from ground water monitoring wells EPA-100, EPA-107, and MW-11, respectively [4, pp. 4, 8-9, 63; 17, pp. 2-4, 14-15]. The three background ground water samples were collected in accordance with the EPA-approved February 2013 Site-Specific QAPP using low-flow sampling techniques and following the stabilization of ground water quality parameters [4, pp. 8-9; 9, pp. 1, 28; 17, pp. 2-4, 14-15]. The three background samples were collected from the screened well intervals which were within the overburden aquifer [17, pp. 2-4, 14-15; 65, p. 69; 88, pp. 145-146, 161-162]. The three background samples were submitted to a CLP laboratory (Chemtech Consulting Group) for analysis of low/medium Aroclor compounds following SOW SOM1.2, and the data were validated at the Tier II level by personnel not involved with the ground water sampling event and according to Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses and the USEPA CLP National Functional Guidelines for Superfund Organic Methods [4, p. 13; 11, p. 2; 74, pp. 1-5, 9-10].

Laboratory analytical results of PCBs in ground water samples GW-01, GW-02, and GW-09 indicated non-detect levels (U qualifier) at the sample-adjusted CRQL [1.0 U micrograms per liter (µg/L) for all reported Aroclors, including Aroclor 1242, presented below] [74, p. 9-10; 83, pp. 1-2, 7-8, 75-76, 79]. Therefore, an

observed release via chemical analysis for PCBs (analyzed as Aroclor 1242) is established when the sample measurement equals or exceeds the sample-adjusted CRQL of 1.0 µg/L [1, p. 51589 (Table 2-3)].

Table 14 - Hazardous Substances Associated with Background Ground Water Samples						
Monitoring Well ID Sample ID	Sample No.	Sample Date	Hazardous - Substance	Concentration (µg/L)	Sample-Adjusted CRQL (µg/L)	References
EPA-100 GW-01	A4A90	4/2/2013	PCBs (Aroclor 1242)	1.0 U	1.0	4, p. 9; 17, pp. 2-3; 74, p. 9; 83, pp. 1-2, 7, 75
EPA-107 GW-02	A4A91	4/2/2013	PCBs (Aroclor 1242)	1.0 U	1.0	4, p. 8; 17, p. 4; 74, p. 9; 83, pp. 1-2, 7, 76
MW-11 GW-09	A4A98	4/2/2013	PCBs (Aroclor 1242)	1.0 U	1.0	4, p. 9; 17, pp. 14-15; 74, p. 10; 83, pp. 1-2, 8, 79

U = Value is Non-Detected [74, pp. 9-10].

CRQL = Contract-Required Quantitation Limit is the substance-specific level that a Contract Laboratory Program (CLP) laboratory must be able to routinely and reliably detect. Used here, the CRQL has been adjusted per the CLP Scope of Work SOM01.2 and represents a sample-specific quantitation limit [1, pp. 51585, 51589; 74; 83]

Ground water sampling events, including the 2013 EPA SR, have defined a plume of PCB-contaminated ground water, within the overburden aquifer, beginning on the Jard property and extending west-northwest toward Park Street [10, pp. 59, 70, 167-169, 240-241; 31, pp. 130, 150, 152; 65, pp. 32, 46-48, 60; 67, pp. 3, 6-10, 12; 88, pp. 10, 22, 47, 84, 107]. During these sampling events, the PCB-contaminated ground water plume within the cobble/sand overburden aquifer has been bounded to the north, northeast, and west by sampling that has indicated non-detect concentrations at the laboratory reporting limit or quantitation limit [10, pp. 59, 70, 167-169, 240-241; 31, pp. 130, 150, 152; 65, pp. 32, 46-48, 60; 67, pp. 3, 6-10, 12; 88, pp. 10, 22, 47, 84, 107]. In addition, PCBs are a group of commercially produced synthetic organic chemicals for which there are no known natural sources in the environment [124, pp. 25-26]. As explained later, the potential non-site sources of PCBs to the environment around the Jard property have been accounted for; and a release from the Jard facility has accounted for the PCB-contaminated ground water (see Attribution portion of the Ground Water Pathway Migration section). Therefore, irrespective of appropriate background sample collection, background concentrations of PCBs in ground water within the local overburden aquifer are expected to be non-detect at laboratory reporting limit or quantitation limit for all samples located outside of the PCB-contaminated ground water plume associated with a release for the Jard property.

- Contaminated Samples:

In February 1991, Wehran Engineering Corporation (Wehran) completed a Phase II ESA for the Jard facility, which was prepared for Laurence Levy, Inc. Trustee and reviewed by VT ANR DEC [36, pp. 1, 9]. Objectives of the Phase II ESA included excavating and sampling test pits near known or suspected areas of contamination around the Jard facility building, and installing and sampling five ground water monitoring wells adjacent to the test pits to provide initial data on the extent of ground water contamination and to define ground water flow direction in the area [36, pp. 9-10, 15-20]. These ground water monitoring wells included MW-WE-3 and MW-

WE-6, which were installed by Clean Harbors, Inc. on 17 September 1990 [36, pp. 19, 41, 43]. Note that these wells are referred to as MW-3 and MW-6 elsewhere in the Phase II ESA report and in subsequent reports, and are therefore referred to as MW-3 and MW-6 within this documentation record [36, p. 21; 65, p. 14]. Ground water monitoring wells MW-3 and MW-6 were screened in the overburden at depths between 2.5 and 8.5 feet bgs and 6.8 and 11.8 feet bgs, respectively [36, pp. 19-20, 41, 43]. Lithologic descriptions were not recorded specifically for the wells, but were presented in data logs for the adjacent test pits [36, p. 19]. According to the Phase II ESA report, the surficial soils encountered at each well consisted of sand, gravel, and occasional cobbles and boulders [36, p. 19]. The material encountered in the test pit adjacent to MW-3 (Test Pit 3) was described down to 3.5 feet bgs as some fill overlying sand and cobbles [36, pp. 17, 19, 34]. The material encountered in the test pit adjacent to MW-6 (Test Pit 6) was described down to 8 feet bgs as fill, sand and gravel, with boulders [36, pp. 17, 19-20, 37]. Because the data logs for the test pits adjacent to monitoring wells MW-3 and MW-6 do not fully characterize the entire depth intervals of the monitoring wells, monitoring well installation/boring logs from adjacent wells MW-3D and MW-6D (discussed below) have also been presented for characterization purposes and to document monitoring well completion within the overburden aquifer.

Between 29 July and 5 August 2010, as part of the Phase II ESA completed by The Johnson Company on behalf of VT ANR DEC, ground water monitoring wells MW-3D, MW-6D, and MW-9D were installed on and downgradient of the Jard property to evaluate the potential presence of dense non-aqueous phase liquids (DNAPLs) in ground water [65, pp. 14, 22, 52]. Monitoring wells MW-3D and MW-6D were installed on the Jard property and paired with the existing monitoring wells MW-3 and MW-6 installed by Wehran [36, pp. 19-21; 65, pp. 14, 20]. Monitoring wells MW-3D and MW-6D were installed adjacent to wells MW-3 and MW-6 based on GPS data collected as part of the 2013 EPA SR [10, pp. 73, 167 -168]. MW-9D was installed downgradient of the Jard property, along the western edge of the Little League property, to investigate the presence of DNAPLs and to determine if a confining layer exists that may interrupt their downward migration [65, pp. 14, 20]. Ground water monitoring wells MW-3D, MW-6D, and MW-9D were installed and screened within the overburden aquifer [65, pp. 23-24, 72, 74, 78].

Based on ground water flow evaluations, ground water monitoring wells MW-3, MW-3D, MW-6, and MW-9D are located downgradient of source areas on the Jard property (see Figure 4) [67, pp. 1, 5, 11; 68, pp. 3, 19-20].

The seven wells (EPA-100, EPA-107, MW-11, MW-3, MW-3D, MW-6, and MW-9D) presented for background and contaminated (release) samples were all installed for the same usage (ground water monitoring wells), and with similar well constructions [e.g., 2-inch-diameter polyvinyl chloride (PVC) pipe with number 10-slotted (0.010-inch) 5- or 10-foot screens, surrounded by filter sand, and finished with bentonite, cement, and grout] [36, pp. 19-20, 41, 43; 65, pp. 23-24, 69, 72, 78; 88, pp. 145-146, 161-162]. The background and release wells were all screened at similar depths [between approximately 2.5 and 32 feet bgs [681.05 to 627.99 above mean sea level (msl)], and within similar overburden materials (generally cobbles, gravel, and sand) within the Jard Overburden Aquifer [36, pp. 41, 43; 54, pp. 1-2; 65, pp. 69, 72, 78; 88, pp. 145-146, 161-162].

The depths of the screened intervals presented below for contaminated ground water monitoring wells were determined based on elevation survey data and documentation provided in well installation/boring logs [36, pp. 41, 43; 53, p. 1; 54, pp. 1-2; 65, pp. 44, 54, 72, 78; 68, p. 7].

Table 15 - Contaminated Ground Water Monitoring Well Details

Monitoring Well ID Sample ID	Location	Installation Date	Screened Interval (amsl)	Screened Interval Geology	References
MW-3 GW-04	Immediately south of the southern edge of the former building footprint on the Jard property.	9/17/1990	681.05 to 675.05	Cobbles, some sand and gravel, little boulders and gravel (fill). ¹	4, p. 10; 36, pp. 16, 19, 34, 41; 54, pp. 1-2
MW-3D GW-05	Immediately south of the southern edge of the former building footprint on the Jard property.	8/2/2010	660.55 to 655.55	Sand, cobbles with sand.	4, p. 10; 65, pp. 14, 23, 52, 72; 54, pp. 1-2
MW-6 GW-06	Immediately west of the western edge of the former building footprint on the Jard property.	9/17/1990	673.34 to 668.34	Sand, some gravel, boulders, and cobbles, little silt. ²	4, p. 10; 36, pp. 16, 19-20, 37, 43; 54, pp. 1-2
MW-9D GW-08	Western edge of the Little League property, west of the Jard property.	8/5/2010	647.62 to 642.62	Sand, cobbles.	4, p. 9; 54, pp. 1-2; 65, pp. 14, 24, 52, 78

amsl = above mean sea level.

¹ The description provided is based on adjacent Test Pit 3, which only characterized part of the depth interval in which MW-3 was screened. Characterization of the approximate depth interval in which MW-3 was screened was logged for monitoring well MW-3D, which was installed to be collocated with MW-3, and was generally described as cobbles, with a thin layer of sand [65, pp. 14, 22, 54, 72].

² The description provided is based on adjacent Test Pit 6, which only characterized part of the depth interval in which MW-6 was screened. Characterization of the approximate depth interval in which MW-6 was screened was logged for monitoring well MW-6D, which was installed to be collocated with MW-6, and was generally described as rock and gravelly sand [65, pp. 14, 22, 54, 74].

On 2 April 2013, as part of the EPA SR, the following ground water samples were collected (monitoring well location in parentheses): GW-04 (MW-3), GW-05 (MW-3D), GW-06 (MW-6), and GW-08 (MW-9D) [4, pp. 9-10; 17, pp. 6-9, 12-13]. These four contaminated ground water samples were collected during the same sampling event and on the same day as the three samples presented above for background comparison [4, pp. 8-10]. In accordance with the EPA-approved Site-Specific QAPP, the four contaminated ground water samples were collected using similar ground water sampling equipment (bladder pumps or peristaltic pumps) and methodologies (i.e. using low-flow sampling techniques and following the stabilization of ground water quality parameters) as the background samples [9, p. 28; 17, pp. 2-4, 6-9, 12-15]. The contaminated ground water samples, along with the background samples, were collected from the screened well intervals which were within the overburden aquifer [17, pp. 2-4, 6-9, 12-15; 36, pp. 34, 37, 41, 43; 65, pp. 69, 72, 78; 88, pp. 145-146, 161-162]. Like the background samples, the four contaminated ground water samples were submitted to a CLP laboratory (Chemtech Consulting Group) for analysis of low/medium Aroclor compounds following SOW SOM1.2, and the analytical data were validated at the Tier II level by personnel not involved with the ground water sampling event according to Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses and the USEPA CLP National Functional Guidelines for Superfund Organic Methods [4, p. 13; 11, pp. 1-2; 17, pp. 6-9, 12-13; 74, pp. 1-5, 9-10].

PCBs (analyzed as Aroclor 1242) were detected in ground water samples GW-04, GW-05, GW-06, and GW-08 at concentrations above each sample-adjusted CRQL, and above the background concentration established by analytical results of background samples GW-01, GW-02, and GW-09; thereby establishing, via chemical analysis, an observed release of PCBs (analyzed as Aroclor 1242) to ground water [1, p. 51589 (Table 2-3); 74, pp. 9-10; 83, pp. 1-2, 7-8, 75-76, 78-79, 82-87].

Table 16 –Hazardous Substances Associated with Contaminated Ground Water Samples						
Monitoring Well ID Sample ID	Sample No.	Sample Date	Hazardous Substance	Concentration (µg/L)	Sample-Adjusted CRQL (µg/L)	References
MW-3 GW-04	A4A93	4/2/2013	PCBs (Aroclor 1242)	93*	20**	17, p. 6; 74, p. 9; 83, pp. 1-2, 7, 82-83
MW-3D GW-05	A4A94	4/2/2013	PCBs (Aroclor 1242)	180*	20**	17, pp. 7-8; 74, p. 9; 83, pp. 1-2, 7, 84-85
MW-6 GW-06	A4A95	4/2/2013	PCBs (Aroclor 1242)	98*	20**	17, p. 9; 74, p. 9; 83, pp. 1-2, 7, 86-87
MW-9D GW-08	A4A97	4/2/2013	PCBs (Aroclor 1242)	9.0	1.0	17, pp. 12-13; 74, p. 10; 83, pp. 1-2, 8, 78

* = Reported value is from diluted analysis [74, p. 9].

** = Reported value is from diluted analysis [83, p. 7].

CRQL = Contract-Required Quantitation Limit is the substance-specific level that a Contract Laboratory Program (CLP) laboratory must be able to routinely and reliably detect. Used here, the CRQL has been adjusted per the CLP Scope of Work SOM01.2 and represents a sample specific-quantitation limit [1, pp. 51585, 51589; 74; 83].

Chemical Analysis – Drinking Water

Several residential properties along Park Street, located west of documented sources on the Jard property, contained active or formerly used private drinking water supply wells during ground water investigations conducted by VT ANR DEC and The Johnson Company in 2010 and 2012 [51, pp. 2, 16; 32, p. 1; 65, pp. 21-22]. Based on evaluations of ground water elevation data obtained from nearby ground water monitoring wells in the area, many of the residential properties along Park Street are located downgradient of source areas on the Jard site [67, pp. 1, 5, 11; 68, pp. 3, 19-20]. Based on chemical analysis of drinking water samples collected on behalf of VT ANR DEC from residential supply wells, PCB concentrations exceeding drinking water benchmarks have been documented in an active residential drinking water supply well, resulting in the closure of the well (see below).

- Background Concentrations:

As noted earlier, background concentrations of PCBs in ground water within the local overburden aquifer are expected to be non-detect at laboratory reporting limit or quantitation limit for all samples located outside of the PCB-contaminated ground water plume (see Chemical Analysis – Ground Water Samples section). Previous Jard Company, Inc.

ground water samples, from the local overburden aquifer located north and northwest of the Jard property, indicate non-detect concentrations of site-related hazardous substances [10, pp. 59, 70, 167-169, 240-241; 31, pp. 130, 150, 152; 65, pp. 32, 46-48, 60; 67, pp. 3, 6-10, 12; 88, pp. 10, 22, 47, 84, 107]. Former drinking water supply wells located west of the Jard property are completed within the overburden aquifer based on observations by field personnel [4, p. 27; 65, pp. 21-24; 120, pp. 1, 4]. Contaminated drinking water samples presented below were collected within the PCB-contaminated local overburden ground water plume [65, p. 60].

- Contaminated Samples

Based on information provided in The Johnson Company Phase II ESA report and by VT ANR DEC, a residential property along Park Street (referred to as property P009) was served by a private drinking water supply well during September 2010 [9, p. 32; 65, pp. 21-23, 61; 89, p. 1]. According to the Phase II ESA report, the well serving the residence at property P009 was located in the basement, and was estimated to be approximately 4 feet deep [9, p. 32; 65, pp. 22-23]. During reconnaissance and sampling events conducted as part of the EPA SR, START personnel discussed previous drinking water sampling activities at property P009 with the VT ANR DEC representative, and observed the drinking water supply well [4, pp. 2-3, 27; 9, p. 32]. On 9 April 2013, START observed the private drinking water supply well in the basement of the residence to be a dug well, constructed with a 2.0-foot-diameter terra cotta pipe extending approximately 3.0 feet below the ground surface of the basement and containing a gravel base [4, p. 27].

During the Phase II ESA, a property owner at another residential property along Park Street (referred to as property P011) informed The Johnson Company of an unused shallow well in the basement of the residence [9, p. 32; 65, pp. 21-22]. This well was a dug well constructed of stone, and was approximately 3 feet in diameter and 6.5 feet deep (presumably below the basement surface) [65, p. 22].

Based on evaluations of ground water elevation data collected from monitoring wells in the area, the private drinking water wells at residential properties P009 and P011 are located downgradient of source areas on the Jard property [9, p. 32; 67, pp. 1-2, 5, 11; 68, pp. 3, 19-20].

The two wells (at properties P009 and P011 along Park Street) presented for contaminated samples were all installed for the same usage (i.e., private drinking water supply wells, although the well at property P011 was not in use at the time of sampling) [9, p. 32; 32, p. 1; 35, p. 2; 65, pp. 22-23]. The three wells exhibit similar well constructions (i.e., shallow dug wells to depths ranging from 3 to 6.5 feet below the basement surfaces), and all draw from the Jard Overburden Aquifer [4, p. 27; 65, pp. 21-23; 120, p. 4].

Table 17 - Contaminated Private Drinking Water Supply Well Details

Monitoring Well ID Sample ID	Location	Installation Date	Well Construction	References
Private Well "Watson"	Basement of residential property P009 along Park Street.	Unknown	Well dug to approximately 3 to 4 feet.	4, p. 27; 9, p. 32; 65, pp. 21-23
Private Well* "Greene Well"	Basement of residential property P011 along Park Street.	Unknown	Well dug to approximately 6.5 feet.	9, p. 32; 65, pp. 21-22

* Note that this well is a former drinking water supply well which was not in use at the time of the investigations [35, p. 2; 65, pp. 21-22]. This well is presented to show evidence of additional contamination in the area at the time of the investigation of the well at property P009.

On 30 August 2010, The Johnson Company, in consultation with VT ANR DEC, collected a ground water sample (“Greene Well”) from the dug well in the basement of the residence at property P011 [9, p. 32; 65, p. 27]. The sample was collected using low-flow procedures [65, pp. 26-27, 223]. On 20 September 2010, VT ANR DEC collected a drinking water sample (“Watson”) from an active drinking water supply well at the residential property referred to as P009 [9, p. 32; 65, pp. 22-23, 27, 61, 175; 89, p. 1]. The sample “Watson” was collected from a spigot located before the pressure tank in the plumbing system, with an upstairs tap running for 10 minutes prior to sample collection [65, p. 27]. Drinking water sample “Watson” and ground water sample “Greene Well” were submitted to Eastern Analytical Inc. laboratory for PCB analysis according to EPA Method 8082 [32, p. 7; 65, pp. 113, 244].

PCBs (analyzed as Aroclor 1016) were detected in drinking water sample “Watson” and ground water sample “Greene Well” at concentrations above their respective reporting limits, and above the background concentration established by analytical results of background sample “Peck Pre-Connection” [32, pp. 1-4; 65, pp. 100, 105, 112, 170, 172, 174]. Therefore, the concentration of PCBs in drinking water sample “Watson”, which was collected from an active drinking water supply well, meets the criteria for observed release and documentation of actual contamination [1, pp. 51589 (Table 2-3), 51592 (Section 2.5)]. As discussed below, PCBs (analyzed as Aroclor 1016 and Aroclor 1242) were used at the Jard property for similar processes as part of historical operations, and these two Aroclor compounds are very similar in chemical composition and chromatographic expression (see Attribution section below). In addition, an observed release to ground water monitoring and drinking water supply wells in the vicinity of the Jard property should be interpreted in the context of known Aroclors used at the facility, namely Aroclors 1016 and 1242 [65, pp. 29-30].

Table 18 –Hazardous Substances Associated with Current and Former Drinking Water Supplies					
Monitoring Well ID Sample ID	Sample Date	Hazardous Substance	Concentration (µg/L)	Reporting Limit (µg/L)	References
Private Well “Watson”	9/20/2010	PCBs (Aroclor 1016)	1.8	0.3	65, pp. 172-174
Private Well “Greene Well”*	8/30/2010	PCBs (Aroclor 1016)	1.3	0.5	65, pp. 100-101, 105, 112

Reporting Limit = Reporting Limit record from Analytical Laboratory Report [65, 170-175]

* Note that this sample was collected from a former residential drinking water supply well which was not in use at the time of sample collection [35, p. 2; 65, pp. 21-22]. This sample is presented to show evidence of additional observed release contamination in the area during the same time frame as the collection of the “Watson” sample.

Attribution:

The hazardous substances (PCBs) used to establish an observed release are associated with the Jard site, and the site has contributed at least in part to the significant increase in hazardous substance concentrations, as described below. Other possible sources of the observed release hazardous substances were investigated through review of file information and observations made during field activities (see Other Possible Sites section below).

Jard operated on the property from 1969 to 1989, producing zinc-coated capacitors (containing approximately 75 pounds of dielectric fluid), small non-fluid transformers, and small motors used in household appliances [20, p. 1; 23, pp. 1-2; 24, p. 5; 25, p. 1; 26, p. 2; 31, pp. 5, 8]. According to file information, the manufacture of the PCB-containing oil-filled capacitors was conducted on the Jard property [23, pp. 1-2; 25, p. 4]. According to a Jard Company, Inc.

summary of PCBs in Vermont prepared by the Agency of Environmental Conservation Department of Water Resources Water Quality Division in April 1976, at the time Jard was the only known PCB user in Vermont [21, pp. 1-2]. Jard received an average of 686,500 pounds of PCBs per year (1971-1974 average) [20, p. 5]. From 1969 to 1971, PCB Aroclor 1242 was used as an impregnating fluid, but by 1971 Jard replaced Aroclor 1242 with Aroclor 1016 [20, p. 5; 21, p. 2]. The Aroclors used at the Jard property constituted a marketed mixture of PCBs, which were manufactured and are not naturally occurring [123, p. 4; 124, pp. 467-468]. Aroclor 1016, which exhibits similar chemical properties and chlorine content as Aroclor 1242, was produced from a vacuum distillation of Aroclor 1242 and was used in similar capacitor applications [65, p. 30; 123, pp. 10, 18; 124, pp. 469, 477]. By 1978 and until operations ceased, DOP, which replaced the use of PCBs, was used as an impregnating fluid for the capacitors and transformers at Jard [29, p. 10].

As part of the manufacturing process, Jard used non-contact cooling water which was discharged to a UST and a perforated concrete drywell south of the facility building [21, p. 2; 29, pp. 7-9; 31, pp. 47, 135; 37, p. 3; 39, pp. 15, 29, 32; 50, p. 1]. Floor drains from inside the building also discharged into the UST [50, p. 1]. Process area trench drains, which were observed to discharge directly into the soils beneath the foundation, contained elevated concentrations of PCBs during an investigation of the facility [31, pp. 31, 52; 39, pp. 15-16, 26, 32, 36]. A subsequent interview with a former employee indicated that during the non-contact cooling, gasket failures would cause the cooling waters and PCB-oils to come into contact [4, p. 27]. These cooling waters would be discharged to the drywell system [4, p. 27]. In addition, analytical results of the contents of an approximately 1,700-gallon tank outside the southern portion of the facility building investigated during an EPA Removal Action indicated PCB concentrations of 47 parts per million (ppm) [39, pp. 14-17, 29, 32-33, 36, 56].

Beginning with a routine industrial waste survey in October 1979, numerous inspections and investigations have taken place at the Jard property which have indicated PCB contamination in soils and ground water adjacent to and beneath the former facility building [10, pp. 72-73, 215-219, 233-241; 23, pp. 1-3; 24, pp. 4-24; 25, pp. 2-22; 26, pp. 1-6; 29, pp. 3-28; 30, pp. 1-37, 64-152; 31, pp. 5-58, 111-154; 33, pp. 1-2; 36, pp. 4-30; 39, pp. 20-66; 40, pp. 2-5; 41, pp. 1-4; 44, pp. 1-9; 46, pp. 11-17, 21-26, 41-42; 59, pp. 1-3; 60, pp. 1-90; 62, pp. 24, 84-85; 65, pp. 9-61; 67, pp. 2-12; 68, pp. 3-4, 9-22]. To address some of the identified contamination, several EPA Removal Actions have been conducted at the Jard property to secure chemicals used in the manufacturing process which were left after the facility closed, conduct limited excavation of contaminated soils, demolish the facility building, remove a portion of the concrete foundation, and cap/secure PCB-contaminated soils to limit public exposure [37, pp. 7-8; 39, pp. 7-9; 42; 43; 62]. Following the 2007 EPA Removal Action, which was the last removal action conducted at the Jard property, additional site investigations have documented the continued presence of PCB Aroclors in site soils and ground water [10, p. 72-73, 215-219, 233-241; 31, pp. 7-36, 112-154; 62, pp. 24, 83-85].

Recent investigations by The Johnson Company, conducted for Vermont ANR DEC, have indicated the presence of Aroclors (Aroclor 1016, Aroclor 1221, Aroclor 1232, and Aroclor 1242) in ground water both beneath and downgradient of the Jard property [65, pp. 46-48, 52; 68, pp. 9-16, 21]. The Johnson Company noted that the congener profile of PCBs in the environment may be modified by various weathering processes [65, p. 30]. Weathering may alter the chromatographic pattern of the Aroclor, making identification difficult and resulting in differing interpretations among laboratories and analysts; therefore, analytical results should be interpreted in the context of known Aroclors used at the Jard property (Aroclor 1016 and Aroclor 1242) [65, p. 30]. In addition, surficial soil conditions may cause heavier components of the Aroclor to adsorb to the soil while lighter components continue to travel within the ground water [65, pp. 30-31; 123, pp. 12, 14 -15]. The Johnson Company concluded that even in the absence of severe weathering, it can be difficult to distinguish between Aroclors and as a result, different laboratories or analysts may not agree on the determination of the assumed Aroclor mix used in the quantification of the PCB concentration in the sample analysis; therefore, laboratory PCB results of environmental samples should be interpreted in the context of the known PCB use at the Jard property over its history, which consists of Aroclor 1242 and Aroclor 1016 [65, p. 30].

Based on the results of ground water elevation data recorded in April 2012, October 2012, and March 2013, ground water in the overburden generally flows from the Jard property toward the northwest [54, pp. 2, 23-24; 67, pp. 1, 5, 11; 68, pp. 3, 19-20]. Ground water flow has been documented to be generally parallel to the Roaring Branch of the Walloomsac River, and piezometric data have indicated that ground water does not discharge to the Walloomsac River along the reach adjacent to the Jard property [31, pp. 22-23, 37, 56; 65, p. 28]. Analytical results of ground water samples collected as part of numerous previous investigations consistently indicated that in general, the highest concentrations of PCB contamination were detected in overburden ground water samples collected in close proximity to the Jard facility building, with lower concentrations detected downgradient (west and northwest) of the building, and relatively very low to non-detect levels of PCBs detected in wells upgradient (east and north) of the building [31, pp. 1, 36-37, 152; 44, pp. 2-3, 9; 65, pp. 12, 31-32, 34, 60; 67, pp. 1-2, 12; 68, pp. 3-4, 21-22]. In addition, PCB contamination has not been detected above laboratory reporting limits in samples collected from piezometers installed at locations south of sources on the Jard property along the Roaring Branch of the Walloomsac River [31, pp. 23, 130, 152; 65, pp. 21-22, 48, 60]. Therefore, the plume of PCB contamination in the overburden ground water aquifer has generally been documented to originate on the Jard property, to be approximately 500 feet in width, and extend to approximately 2,000 feet downgradient (to the northwest), bounded to the south by ground water monitoring wells and the Roaring Branch of the Walloomsac River, and to the north by ground water monitoring wells on the northern portions of the property adjacent/west of the Jard property (P031) and Bowen Road [10, pp. 70-71; 65, pp. 32, 34, 60; 67, pp. 2, 12; 68, pp. 3, 21-22]. Based on ground water analytical sample results indicating detectable levels of PCBs, the impacted ground water plume extends at least as far west as monitoring wells EPA-104S and EPA-104D; no known ground water samples have been collected from monitoring wells beyond this point [68, pp. 9, 21-22].

The documented trends exhibited by the overburden ground water contamination plume have been interpreted during previous investigations to be indicative of a source of PCBs located south of the former facility building, potentially associated with the former storage of PCB oil product in tanks in this area, releases from floor trench drains to subsurface soils, and releases to facility drywells [31, pp. 51-52, 135; 39, pp. 14-17, 32-33, 36, 56]. Recent analytical sampling results have confirmed the ongoing presence of significant levels of PCBs within contaminated soil and pile sources, available to the ground water pathway due to the lack of containment features associated with the sources, which supports at least partial attribution of the hazardous substances to releases from the site (see Source Evaluation section) [1, p. 51588, Section 2.2.2].

Some investigations have noted one apparent anomaly to the documented PCB ground water plume, located northwest and cross-gradient of sources on the Jard property and based on slightly elevated concentrations of PCBs in a ground water monitoring well (MW-12) west of the Plasan facility (formerly US Tsubaki) [65, pp. 25, 47, 60; 67, pp. 9, 12; 68, pp. 14, 21]. However, the levels of PCBs detected in ground water samples collected from monitoring well MW-12 during various investigations have consistently been lower than concentrations detected in other ground water monitoring wells located within the documented plume; most significantly, PCB concentrations detected in MW-12 have been at least 2 to 3 orders of magnitude lower than concentrations detected in well MW-3, located immediately south of the former facility building footprint [65, pp. 46-47; 67, pp. 7-9, 12; 68, pp. 3-4, 14, 21]. In addition, previous investigations of the US Tsubaki facility have indicated that PCBs were not used as part of operations and have not been detected in ground water and soil samples collected from the property (see Other Possible Sites section below) [109, pp. 47, 183-190; 110, pp. 8-9]. Current operations at the Plasan facility (adjacent to monitoring well MW-12) include the manufacture of body armor and armored vehicles for civilian and military personnel [125]. The Plasan facility has not been identified via Resource Conservation and Recovery Information System (RCRIS) or Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) searches to be involved in the storage or use of PCBs [113, pp. 38-39].

Other Possible Sites:

A review of the EPA CERCLIS and RCRIS databases identified seven CERCLIS and 142 Resource Conservation and Recovery Act (RCRA) sites in Bennington, VT, including the Jard site [113]. The seven sites identified in the CERCLIS database search include the Kocher Drive Dump and Park Street sites located north of the Roaring Branch of the Walloomsac River and within 0.73 miles the Jard site [113, pp. 1-5]. Activities at the Park Street site, located downgradient of the Jard property, have included assessment and removal of PCB contamination from the Jard property sources [61, p. 4; 66, p. 2; 88, p. 2]. A search of the VT ANR DEC Waste Management Hazardous Site List was performed for the Town of Bennington and within one radial mile of the Jard site, to identify sites with similar operational activities, or with manifests for substances similar to or the same as the contaminants of concern at the Jard property [104]. The search listed a total of 158 site locations within Bennington [104]. Of the 158 sites, two sites were identified within one radial mile, and as where PCBs have been a contaminant of concern [104]. These two sites (Kocher Drive Dump and Vermont Composites), and one additional site [US Tsubaki (currently Plasan)] located in close proximity to the Jard property, are summarized below.

Kocher Drive Dump:

The Kocher Drive Dump site is located approximately 0.6 miles northwest of the Jard property [104]. The site operated as a town-owned landfill between 1955 and 1969, and accepted municipal and industrial wastes, including battery wastes, electrical oils, capacitors, solvents, dyes, and cellulose nitrate [106, p. 3]. Sampling conducted as part of the EPA Removal PA/SI indicated the presence of PCBs in sediments and soils on the Kocher Drive Dump property [107, pp. 32-36, 110-124]. However, no PCBs were detected in ground water and surface water samples collected as part of the investigation [107, p. 21]. In addition, elevation data from ground water monitoring wells between the Kocher Drive Dump site and the Jard site, located on the Vermont Composites site, do not support the migration of PCBs from this area to the south-southeast (see Vermont Composites summary below).

Vermont Composites:

The Vermont Composites site is located approximately 0.45 miles northwest of the Jard property [104]. PCBs have been detected in site soils in one sample, at levels below an EPA Regional Screening Level, in an area on the northeastern portion of the facility which contained a transformer [108, pp. 12, 21, 28, 36, 39, 80]. As part of a Site Investigation, The Johnson Company concluded that the source of the PCB (Aroclor 1254) contamination was a minor release during replacement of the historical transformer, which was unlikely to migrate farther (there were no detections in ground water) [108, pp. 12, 28, 36, 39]. Ground water monitoring wells installed on the facility indicate that ground water flow direction is to the west, cross-gradient to the Jard site [108, pp. 16, 38].

US Tsubaki:

The former US Tsubaki site is located directly adjacent to (north of) the Jard site and was the former location of a sprocket manufacturer [104]. Hazardous waste streams produced on the property included waste hydraulic oil, water soluble coolants, metal scraps, filter media, coolant fluid, corrosive wastes, and paint sludge [109, pp. 13-14]. Based on the Tighe & Bond Phase I Site Assessment Update and Environmental Site Investigation Report, soil and ground water sampling on the property has not indicated the presence of PCBs in these media [109, pp. 47, 183-190; 110, pp. 8-9].

Ground Water Migration Pathway
Overburden Aquifer – Likelihood of Release

Hazardous Substances Released

PCBs (Aroclors 1242 and 1016)

Ground Water Observed Release Factor Value: 550

3.1.2 POTENTIAL TO RELEASE

Potential to Release Factor Value: Not Evaluated

3.2 WASTE CHARACTERISTICS

3.2.1 TOXICITY/MOBILITY

Table 19 - Toxicity/Mobility Factor Value						
Hazardous Substance	Source No. (and/or Observed Release)	Toxicity Factor Value	Mobility Factor Value	Does Haz. Substance Meet Observed Release by Chemical Analysis? (Y/N)	Toxicity/Mobility (Ref. 1, Table 3-9)	References
PCBs	1, 2	10,000	1*	Y	10,000	1, pp. 51601 (Section 3.2.1.2), 51602 (Table 3-9); 2, p. A-296

* For any hazardous substance that meets the criteria for an observed release by chemical analysis to one or more aquifers underlying the sources at the site, regardless of the aquifer being evaluated, assign a mobility factor value of 1 [1, p. 51601 (Section 3.2.1.2)].

Toxicity/Mobility Factor Value [1, p. 51602 (Table 3-9)]: 10,000

3.2.2 HAZARDOUS WASTE QUANTITY

Table 20 - Hazardous Waste Quantity			
Source No.	Source Type	Source Hazardous Waste Quantity	Source Hazardous Constituent Quantity Complete?
1	Contaminated Soil	3.14	N
2	Pile	13,300	N

Sum of Values: 13,303

Based on HRS Section 2.4.2.2, if the Hazardous Constituent Quantity is not adequately determined for one or more sources, and if any target for the ground water pathway is subject to Level I or Level II concentrations, a factor value is assigned from Table 2-6 or a value of 100, whichever is greater, as the Hazardous Waste Quantity Factor Value for that pathway [1, pp. 51591-51592 (Section 2.4.2.2)].

Hazardous Waste Quantity Factor Value [1, p. 51591 (Table 2-6)]: 10,000

3.2.3 WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

The Toxicity Factor Value (10,000) and the Mobility Factor Value (1.0) for PCBs are multiplied in order to determine the Toxicity/Mobility Factor Value (10,000) [1, p. 51602 (Section 3.2.1.3, Table 3-9)]. The Toxicity/Mobility Factor Value is multiplied by the Hazardous Waste Quantity Factor Value to determine the Waste Characteristics Factor Category Value, subject to a maximum value of 1×10^8 [1, pp. 51592 (Section 2.4.3.1), 51602 (Section 3.2.3)]. Based on this Waste Characteristic product, a Waste Characteristic Factor Category Value of 100 is assigned [1, p. 51592 (Table 2-7)].

Ground Water Migration Pathway
Targets

Toxicity/Mobility Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 10,000

Toxicity/Mobility Factor Value \times Hazardous Waste Quantity Factor Value: 1×10^8

Waste Characteristics Factor Category Value [1, p. 51592 (Table 2-7)]: 100

3.3 TARGETS

Level I Concentrations

Based on chemical analysis, PCBs (analyzed as Aroclor 1016) were detected in a private residential drinking water supply well at a concentration meeting the criteria for actual contamination and exceeding the EPA Maximum Contaminant Level (MCL), thereby establishing a Level I concentration [1, pp. 51592-51593 (Sections 2.5, 2.5.1, 2.5.2)].

Table 21 - Level I Concentrations					
Sample ID	Hazardous Substance	Hazardous Substance Concentration ($\mu\text{g/L}$)	Benchmark Concentration ($\mu\text{g/L}$)	Benchmark	References for Benchmark
Watson	Aroclor 1016 (PCBs)	1.8	0.5	MCL	2, p. A-296; 65, p. 48

PCBs (analyzed as Aroclor 1016) were detected above the MCL in a drinking water source supplying four residents [121]. The sample was collected on 20 September 2010 [65, pp. 22-23, 27, 61; 89, p. 1]. On 28 September 2010, due to the levels of contamination exceeding the MCL and State action levels, VT ANR DEC recommended to the residents to discontinue drinking water supplied by the private drinking water well, and the well was reportedly abandoned [4, p. 27; 122]. Between 28 and 29 October 2010, due to the documented levels of PCB contamination, the impacted residential property was connected to the municipal water supply in Bennington, VT [4, pp. 2-3; 38, p. 1; 122].

3.3.1 NEAREST WELL

Due to a documented drinking water supply well subject to Level I concentrations, a Nearest Well Factor Value of 50 is assigned [1, pp. 51602-51603 (Section 3.3.1)]. The closest drinking water supply well containing Level I concentrations of the target compounds (PCBs) is the well located on property P009, located between 828 and 1,244 feet west-northwest of the sources presented in this HRS Documentation Record (see Figure 4) [48].

Well ID: Private residential well at property P009

Level of Contamination (I, II, or potential): I

If potential contamination, distance from source in miles:

Nearest Well Factor Value [1, p. 51603 (Table 3-11)]: 50

3.3.2 POPULATION

3.3.2.1 Level of Contamination

3.3.2.2 Level I Concentrations

Based on information provided by the resident at P009 to VT ANR DEC, the drinking water supply well documented with Level I concentrations served four residents at the time of documented contamination [121]. Previous estimates indicated by VT ANR DEC personnel, of six to seven residents, were revised based on information from the residents using the well during its closure [4, p. 27; 121].

Level I Population Targets

Table 22 - Level I Population Targets			
Level I Well	Aquifer No.	Population	References
P009 drinking water supply well	1	4	121

Sum of Population Served by Level I Wells: 4

Sum of Population Served by Level I Wells x 10: 40

Level I Concentrations Factor Value [1, p. 51603 (Section 3.3.2.2)]: 40

3.3.2.3 Level II Concentrations

Level II Population Targets

No Level II Population Targets have been identified.

Level II Concentrations Factor Value 1, p. 51603 (Section 3.3.2.3)]: 0

3.3.2.4 Potential Contamination

Potential Population Targets

The potential population relying on ground water supply sources within 4 radial miles of sources on the Jard property was evaluated but not scored as part of this HRS Documentation Record [56].

Potential Contamination Factor Value: Not Scored

3.3.3 RESOURCES

No Resources were evaluated as part of this HRS Documentation Record.

Resources Factor Value: Not Scored

3.3.4 WELLHEAD PROTECTION AREA

No Wellhead Protection Areas were evaluated as part of this HRS Documentation Record.

Wellhead Protection Area Factor Value: Not Scored

4.0 SURFACE WATER MIGRATION PATHWAY

4.0.1 GENERAL CONSIDERATIONS

Although migration of contaminants via overland flow/flood component to the Jard Surface Water Pathway has likely occurred, especially during flood events, limited data is available to support the overland flow/flood component to the Jard Surface Water Pathway. As noted below (see Section 4.2), the migration of contaminants from on-site sources to the Jard SWP via the ground water to surface water component has been documented. Therefore, the migration of PCB contaminants to the Jard Surface Water Pathway via the overland flow/flood component will not be evaluated, and the migration of PCB contaminants to the Surface Water Pathway via the ground water to surface water component is presented in this documentation record.

Localized overland flow to drainage swales and ditches and previous flooding events occurring along the Roaring Branch of the Walloomsac River may have resulted in PCB contaminants migrating from Source Nos. 1 and 2 to the Jard surface water pathway (SWP) via the overland flow/flood component [126, p. 28; 127, p. 1; 129; 133]. Investigations on the Jard property have indicated the presence of PCB-contaminated soils in areas both around and below the former building footprint [30, pp. 14-16, 18, 20-21, 28-29, 33, 36-37, 70-95, 119-137; 31, pp. 8-9, 14, 16-18, 31-33, 35, 112, 117-128, 142-143, 145-147; 65, pp. 12-13, 16, 19, 43, 52]. Soil samples collected and analyzed for PCBs throughout the developed and undeveloped former facility areas, including beneath the facility building, around the facility building, and around the larger undeveloped wooded areas extending south to the Roaring Branch of the Walloomsac River, revealed widespread PCB contamination, including the area extending south to the Roaring Branch [31, pp. 5, 7, 43, 137-138, 142-143, 145-147].

Prior to the razing of the Former Facility Building, the topography of the Jard property was generally level to the east and south of the former building, level to slightly hummocky to the north of the building, and sloping moderately away from the building on its western side, with a small seasonal drainage swale trending along the northwestern portion of the property and continuing northwest along Bowen Road [30, p. 5; 31, p. 7]. In addition, a berm of variable height, comprised of dredged river channel material, was located in the wooded area of the property along the northern bank of the Roaring Branch [31, p. 46]. This berm was reportedly constructed to prevent encroachment of the Roaring Branch on properties on the north side of the river, but also serves to inhibit overland flow from the Jard property from directly entering the river [31, p. 46]. In 2010, a stream restoration project was completed along the reach of the river adjacent to the Jard property, a component of which included the excavation of the berm and construction of a new berm closer to the facility building [65, pp. 10, 25, 52]. The berm along the Roaring Branch was previously located approximately 90 feet north of the northern edge of the river, but the new berm was constructed closer to the Jard facility building (approximately 40 feet farther north), as part of a floodplain restoration project to allow the river to access more of the historical floodplain and to reduce future flood damage [65, p. 10]. PCB sampling results of the area extending south on the Jard property to the Roaring Branch, including the area of soil material excavated during the 2010 river restoration project, indicate PCB contamination consistent with the release of PCBs from the Jard operations [14, pp. 1-4, 7; 16; 65, pp. 10, 52, 57, 145, 146].

On 28 August 2011, the partially completed floodplain restoration project was severely tested by Tropical Storm Irene, resulting in heavy, sustained rains in Southern Vermont which caused the Roaring Branch of the Walloomsac to overspill its banks [126, p. 28; 127, p. 1]. Flooding of the Roaring Branch caused a partial breach of the new armored berm at the transition point where the floodplain narrows from the newly restored section to the upstream approach to the Park Street Bridge [126, p. 28]. This damaged area is located along the southwestern portion of the former Jard facility and resulted in flood waters flowing across a portion of the former Jard facility before flooding areas to the west, including areas along Park Street [4, p. 2; 129, p. 1; 133, pp. 1-2].

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

4.1.1 GENERAL CONSIDERATIONS

As noted above, previous flooding events occurring along the Roaring Branch of the Walloomsac River have likely resulted in PCB contaminants migrating from Source Nos. 1 and 2 to the Jard Surface Water Pathway via the overland flow and via groundwater to surface water components. Although migration of contaminants via overland flow to the SWP has likely occurred, especially during flooding events, based on the available supporting data, this documentation record will evaluate the Jard SWP via the ground water to surface water component.

4.2 GROUND WATER TO SURFACE WATER COMPONENT

4.2.1 GENERAL CONSIDERATIONS

This documentation record presents data from selected background and contaminated sediment samples to document an observed release of PCBs, via chemical analysis, to the Jard surface water pathway (SWP) via the ground water to surface water component. This record documents an observed release of PCBs by chemical analysis, both to the Jard local overburden aquifer and to an Unnamed Stream, with some portion of the significant increase attributable to sources at the Jard facility, and documents an actual contamination at Level II concentrations to an Environmental Threat Target (HRS-eligible wetland frontage) located within 1 mile of sources (see below). Based on the results of ground water elevation data recorded in April 2012, October 2012, and March 2013, ground water in the overburden aquifer generally flows from sources on the Jard property, without any discontinuities (as noted above in Section 3.0.1), toward the northwest, parallel to the Roaring Branch of the Walloomsac River, and discharges to the downgradient surface water bodies (Greene and Duck Ponds) [54, pp. 2, 23-24; 67, pp. 1, 5, 11; 68, pp. 3, 19-20]. Available data substantiate that the top of the overburden aquifer is at or above the bottom of the surface water at Greene and Duck Ponds (see below).

Investigations completed by The Johnson Company in 2010 and 2013 presented the results of piezometer measurements which were used to assess the discharges of ground water to Greene Pond and Duck Pond, located at and near the headwaters of the Unnamed Stream, west of the Jard property (see Figures 2 and 6B) [4, p. 68; 65, pp. 20, 52; 68, pp. 1-3, 7, 8; 101, p. 1, 3]. As further explained below, water levels in the piezometers installed in Greene Pond and Duck Pond indicated an upward vertical gradient, indicating gaining conditions within these surface water bodies via ground water to surface water flow [65, pp. 28, 44, 45; 68 pp. 3, 7, 8, 19]. The Johnson Company 2010 Limited Phase II ESA Report noted that the conclusion of gaining conditions at these surface water bodies was further supported by the presence of seeps near the base of the slope above Duck Pond [65, p. 28].

In addition, the Phase II ESA Report presented data for six piezometers installed in the Roaring Branch of the Walloomsac River [65, pp. 21, 44-45, 52, 59]. In general, measured water levels indicated that the Roaring Branch was a losing stream, with some temporal or location-specific exceptions [65, pp. 28, 44-45, 52, 59]. Piezometer location PZ-04, located west of and downgradient of the Jard property, was the only location where the Roaring Branch was consistently gaining, possibly as a result of its placement immediately below a drop in streambed elevation [65, pp. 21, 27, 44-45, 52-54, 57-59]. Water level differences between the stream and piezometer were relatively small at PZ-04 [65, pp. 21, 44-45, 59]. Interpretation of the data may indicate that the ground water to surface water component potentially intersects with the Roaring Branch of the Walloomsac River at this location.

The migration of PCB contaminants to the Jard SWP via the ground water to surface water component has likely occurred along two separate branches of the SWP, including the Roaring Branch of the Walloomsac River located to the south and west of the Jard property, and the Unnamed Stream, with the probable point of entry (PPE) located at Greene Pond. Available data supports the migration of PCB contaminants to the Jard SWP via the ground water to surface water component along the Unnamed Stream west of the Jard property, which is therefore presented in this documentation record.

4.2.1.2 Definition of Hazardous Substance Migration Path for Ground Water to Surface Water Migration Component

The ground water to surface water migration pathway at this site extends from the site sources into the Jard local overburden aquifer to both an Unnamed Stream and the Roaring Branch of the Walloomsac River. This overburden aquifer and the observed release of PCBs to it are described in sections 3.0.1 and 3.1.1 of this HRS documentation record.

For this pathway component, HRS-eligible surface waters are those for which surface water is within 1 mile of one or more sources with containment factor values greater than 0, there is no aquifer discontinuity between the source and the surface water that is within one mile, and the “top of the uppermost aquifer is at or above the bottom of the surface water” [1, p. 51626 (Section 4.2.1.1)]. On 30 August 2010, The Johnson Company measured the elevation of the top of the Uppermost Aquifer, within piezometer PZ-14 at Greene Pond (the surface water PPE), to be 658.56 feet above msl [65, pp. 28, 44, 45, 52; 100, pp. 1-3].

As described below, the elevation of the bottom of the surface water body at the intersection of the Jard local overburden aquifer and HRS-eligible surface water at the PPE to the in-water segment of the surface water pathway is less than 658.12 feet above msl.

Based on investigations, conducted by The Johnson Company using piezometers, ground water discharges to local surface water bodies in the area of the Jard property were examined [65, pp. 4, 11-12, 20, 28, 44-45, 52; 68, pp. 3, 7-8; 100, pp. 1-9]. During July and August 2010, as part of The Johnson Control Phase II ESA, nine piezometers were installed in the vicinity of the Jard property, two of which were used to assess potential discharges of ground water to Duck Pond and Greene Pond [65, pp. 20, 22, 26]. Piezometer PZ-13 was installed in Duck Pond, approximately 30 feet west of MW-13; while piezometer PZ-14 was installed in Greene Pond, located on a residential property along Park Street, west of the Little League fields [65, p. 22]. Based on piezometer data, the top of the Uppermost Aquifer was determined to be above the bottom of the surface water bodies at Greene and Duck Ponds.

On 6 and 30 August 2010, The Johnson Company measured the depths to water inside and outside the installed piezometers [65, pp. 26-27, 44, 45]. By comparing water levels inside and outside the piezometer, a determination was made as to whether the surface water body in which the piezometers were installed was gaining (receiving ground water) or losing (discharging to ground water) [65, p. 20]. The elevation of the top of the ground water table (Jard local overburden aquifer) at Greene Pond (PZ-14) and Duck Pond (PZ-13) was measured at 658.56 and 656.19 feet above msl, respectively [65, pp. 44, 45, 53, 54]. The elevation of the *top* of the surface water at Greene Pond (PZ-14) and Duck Pond (PZ-13) was determined to be 658.12 and 655.56 feet above msl, respectively [65, pp. 26, 44, 45; 100, pp. 1-3]. Water levels in the piezometers installed in Duck Pond and Greene Pond indicated that these surface water bodies were gaining [65, pp. 28, 44, 45]. Although the elevation of the *bottom* of the surface water body at the PPE (Greene Pond) was not measured directly, based on the elevation measurement of the top of the surface water level at the PPE in Greene Pond, the bottom elevation of the surface water body must be below 658.12 feet above msl [100, pp. 1-3]. The Johnson Company report

noted that this conclusion of gaining conditions within Greene and Duck Ponds was further supported by the presence of seeps near the base of the slope above Duck Pond [65, p. 28].

Surface Water Probable Point of Entry and In-water Segment Description

Branch 1 of the in-water component of the Surface Water Pathway for the Jard site is located in the Hudson-Hoosic Watershed and includes the following surface water bodies: an Unnamed Stream (including Greene and Duck Ponds) (0.33 miles), Furnace Brook (1.91 miles), and the Walloomsac River (12.76 miles) (see Figure 7) [101, pp. 1-3]. The most upstream PPE to the Unnamed Stream is located within the small drainage pond, referred to as Greene Pond, where ground water discharge to surface water has been documented [4, pp. 68, 71; 65, pp. 22, 28, 58; 101, p. 1]. The PPE is located 0.13 miles from Source No. 1 (Contaminated Soil) and 0.20 miles from Source No. 2 (Pile), both of which have a containment factor value greater than zero for a release to ground water (see Source Characterization Section) [102, pp. 2, 7]. Sediment samples SD-30 and SD-31, collected as part of the 2013 EPA SR, were located in Greene Pond at the headwaters of the Unnamed Stream [4, pp. 68, 71; 101, p. 1; 102, p. 1]. Surface water flow exits Greene Pond and flows north along the Unnamed Stream, through a culvert under the entrance to the Little League fields, and discharges to Duck Pond [4, p. 71; 101, p. 1-3]. Exiting Duck Pond, flow continues northward along the Unnamed Stream, entering a culvert and continuing northwest beneath Park Street for approximately 45 feet [4, p. 71; 101, p. 1-3]. The 2013 EPA SR documented the continuous and perennial flow of the Unnamed Stream from Greene Pond to Duck Pond and downstream of Duck Pond through observations and confirmation by local residents along Park Street [4, pp. 68, 71; 129, p.1; 133, p.1]. The Surface Water Pathway continues northwestward above ground, traversing residential properties and then an undeveloped property before converging with Furnace Brook [4, p. 71; 101, p. 1-3]. The Surface Water Pathway continues along Furnace Brook, in a northwest direction, for 1.91 miles, prior to converging with the Walloomsac River [101, p. 1-3]. Surface water flow continues along the Walloomsac River west-northwestward for approximately 5.51 miles to the New York State Border [101, p. 1-3]. Flow continues along the Walloomsac River westward for the remaining 7.25 miles to the terminus of the downstream Surface Water Pathway, near North Hoosick, New York [101, p. 1-3].

A second branch of the in-water component of the Surface Water Pathway for the Jard site was evaluated and includes the following surface water bodies: Roaring Branch of the Walloomsac River (0.70 miles) and the Walloomsac River (14.3 miles) (see Figure 7) [134, pp. 1]. The most upstream PPE to this branch of the in-water component of the Jard Surface Water Pathway is represented by the shortest straight-line distance to the Roaring Branch of the Walloomsac River, located south of Source Nos. 1 and 2 where the discharge of ground water to surface water occurs [1, p. 51626 (Section 4.2.1.2); 102, pp. 1-2, 7; 134, pp. 1, 6]. The PPE is located approximately 0.04 miles from Source No. 1 (Contaminated Soil) and 0.1 miles from Source No. 2 (Pile), both of which have a containment factor value greater than zero for a release to ground water (see Source Characterization Section) [102, pp. 1, 2, 7]. Surface water flow continues along the Roaring Branch of the Walloomsac River west-northwestward for approximately 0.70 miles to the Northside Drive Bridge, where it joins the Walloomsac River [101, pp. 1-4; 128, pp. 13, 18, 20]. Flow continues along the Branch 2 for 1.53 miles, where Furnace Brook (Branch 1) discharges into the Walloomsac River [101, p. 4; 134, p. 1]. Surface water flow continues along the Walloomsac River west-northwestward for approximately 7.2 miles to the New York State Border [101, p. 1-3]. Flow continues along the Walloomsac River westward for the remaining 7.25 miles to the terminus of the downstream Surface Water Pathway, near North Hoosick, New York [101, p. 1-3].

Contamination has been documented to the surface water migration pathway via the ground water to surface water component from the PPE at Greene Pond, along a 0.33-mile in-water segment of the Surface Water Pathway (see below). A release of contamination at least partially attributable to sources on the Jard property has been documented, via chemical analysis, for eight sediment samples collected along the Unnamed Stream (SD-31A, SD-32A, SD-36A, SD-39A, SD-41, SD-46A, SD-47A, and SD-49A) (see below). The most-upstream

PPE for both Source No. 1 (Former Facility Source) and Source No. 2 (Excavated Material Pile) for this branch of the Surface Water Pathway is the headwaters for the Unnamed Stream (Greene Pond), which is the location of EPA SR sediment sample locations SD-30 and SD-31.

4.2.1.3 Observed Release of a Specific Hazardous Substance to Surface Water In-Water Segment

Observed Release to Surface Water by Chemical Analysis

An observed release of hazardous substances (PCBs, analyzed as Aroclor 1242) to surface water, via a PPE at Greene Pond (see section 4.2.1.2 of this HRS documentation record), associated with sources on the Jard property, is documented via chemical analysis by comparing similar background and contaminated sediment samples, as described below. Previous investigations have documented PCB contamination within the wetland area located west of Park Street and have suggested the potential may exist for liquid phase PCBs in ground water to impact the neighboring surface water pathway, to the west of the Jard property (Duck Pond, the Unnamed Stream, and wetlands west of Park Street) [65, pp. 9-10, 28, 33-35, 60; 66, pp. 10, 22, 27, 29-30, 32-33; 88, pp. 3, 9, 17 -18, 26-27, 29-32]. In addition, the EPA SR also documented several PCB-contaminated sediment samples (on property P030) within the wetland areas west of Park Street and south of the wetland frontage bordering the Unnamed Stream evaluated in this Documentation Record below [10, pp. 34-38, 56, 59, 74, 170-172, 220, 242-243; 12, pp. 3, 14].

- Background Concentrations:

On 16 April 2013, as part of the EPA SR and in accordance with the EPA-approved February 2013 Site-Specific QAPP, background sediment sampling activities were conducted [4, pp. 54-56; 9, pp. 1, 29 -32, 39]. Five background sediment samples (SD-51A, SD-51C, SD-52C, SD-53A, and SD-54C) were collected from a wetland area on a n undeveloped parcel located north-northeast of the Jard property to document natural background conditions in the local vicinity of the site (see Figures 2 and 6A) [4, pp. 55-56; 7; 12, pp. 2, 9 -10, 12, 13; 18, pp. 52, 54, 57, 58, 63]. The background sediment sample results and references reviewed support that PCBs are neither naturally occurring nor ubiquitous in the local environment and that there is no other known source(s) of PCBs in the area (see below) [124, pp. 25-26].

In addition to the five background sediment samples, eight contaminated sediment samples (SD-31A, SD-32A, SD-36A, SD-39A, SD-41A, SD-46A, SD-47A, and SD-49A) were collected on 16 April 2013, as part of the EPA SR, from the wetland and stream area located west of the Jard property (see Figure 6B) [4, pp. 56-59; 18, pp. 25, 27, 31, 35, 37, 43 -44, 48, 52, 54, 57, 58, 6 -3]. Background sediment samples were collected in the vicinity of the site from a similar wetland environment as the contaminated sediment samples presented to document an observed release (see Contaminated Samples section below) [4, pp. 54-59; 12, p. 2; 18, pp. 25, 27, 31, 35, 37, 43-44, 48, 52, 54, 57, 58, 63; 78]. The five background sediment samples were collected from the same depth interval (0 to 2 feet), during the same time period, and utilizing the same collection and analytical methods as the eight contaminated sediment samples [4, pp. 54-60; 12, pp. 2, 10, 35-38; 11, pp. 13-14, 16; 18, p. 25, 27, 31, 35, 37, 43, 44, 48, 52, 54, 57, 58, 63; 78].

Table 23 – Background Sediment Sample Location Descriptions

Sample ID	Sample Medium	Sample Location	Depth* (inches)	Date	References
SD-51A (A4C22)	Wetland Sediment	Sediment located north of the Jard property, east of Bowen Road.	0-6	4/16/2013	4, pp. 55, 64; 10, pp. 75, 177; 18, p. 52

Table 23 – Background Sediment Sample Location Descriptions

SD-51C (A4C24)	Wetland Sediment	Sediment located north of the Jard property, east of Bowen Road.	12-24	4/16/2013	4, pp.55, 64; 10, pp. 75, 177; 18, p. 54
SD-52C (A4C27)	Wetland Sediment	Sediment located north of the Jard property, east of Bowen Road.	12-24	4/16/2013	4, pp. 55, 64; 10, pp. 75, 177; 18, p. 57
SD-53A (A4C29)	Wetland Sediment	Sediment located north of the Jard property, east of Bowen Road.	0-6	4/16/2013	4, pp. 55, 64; 10, pp. 75, 177; 18, p. 58
SD-54C (A4C26)	Wetland Sediment	Sediment located north of the Jard property, east of Bowen Road.	12-24	4/16/2013	4, pp. 56, 64; 10, pp. 75, 178; 18, p. 63

* Depth below water/sediment interface

As presented in Table 26, the five background sediment samples collected as part of the EPA SR contained varying compositions of naturally occurring native matrix materials (*i.e.*, sand, silt, clay, gravel, and organic matter) [18, pp. 52, 54, 57, 58, 63]. Similarly, the contaminated sediment samples presented below exhibited varying compositions of the same naturally occurring native matrix materials (see Contaminated Samples section below) [18, pp. 25, 27, 31, 35, 37, 43, 44, 48, 52, 54, 57, 58, 63; 78]. The analytical results of each contaminated sediment sample were compared to the contaminant concentrations detected only in those background sediment samples which displayed the most similar matrix composition [78].

Table 24 – Background Sample Matrix Description

Sample ID	Sample Description	Reference
SD-51A (A4C22)	Saturated dark brown-to-black, ORGANICS and SILT, little clay, trace fine to coarse sand.	18, p. 52
SD-51C (A4C24)	Saturated, dark brown, SILT, some clay, trace organics, trace fine to coarse sand, trace fine to medium gravel.	18, p. 54
SD-52C (A4C27)	Saturated, brown, fine-to-medium SAND and fine-to-medium GRAVEL, little coarse sand, little silt, trace clay, trace organics.	18, p. 57
SD-53A (A4C29)	Wet, dark brown, SILT, little clay, little organics, trace fine to coarse sand.	18, p. 58
SD-54C (A4C26)	Moist, brown to dark brown, fine to medium SAND and SILT, some clay, trace coarse sand, trace organics.	18, p. 63

The five background sediment samples were submitted to a CLP laboratory (Chemtech Consulting Group) for analysis of low/medium Aroclor compounds following SOW SOM1.2, and the data were validated at the Tier II level by personnel not involved with the sediment sampling event and according to Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses and the USEPA CLP National Functional Guidelines for Superfund Organic Method [4, pp. 55, 56, 61, 64; 11, p. 16; 76, pp. 1-4, 8; 77, pp. 1-4, 8-9]. As part of this HRS Documentation Record and the evaluation of background concentrations, the following hazardous substance in background sediment samples is presented: Aroclor 1242 (PCBs).

Laboratory analytical results of PCBs (analyzed as Aroclor 1242) in sediment samples SD-51A, SD-51C, SD-52C, SD-53A, and SD-54C indicated non-detect levels at the sample-adjusted CRQLs (ranging from 45 µg/Kg to 71 µg/Kg for Aroclor 1242) [76, p. 8; 85, pp. 1-2, 4-5, 47; 77, pp. 8-9; 86, pp. 1-2, 4-5, 7-8, 93, 95-96, 98]. An observed release via chemical analysis of PCBs (analyzed as Aroclor 1242) is established when the sample measurement equals or exceeds the sample-adjusted CRQL of the representative/similar background sample [1, p. 51589 (Table 2-3)]. Among the five background sediment samples, PCBs (analyzed as Aroclor 1242) were not detected, with the highest sample-adjusted CRQL at 71 µg/Kg in samples SD-51A (A4C22) and SD-53A (A4C29) [76, p. 8; 77, pp. 8-9; 85, p. 5; 86, pp. 7-8].

Table 25 – Hazardous Substances Associated with Background Sediment Samples				
Sample ID	Hazardous Substance	Concentration (µg/Kg)	Sample-Adjusted CRQL (µg/Kg)	References
SD-51A (A4C22)	PCBs (Aroclor 1242)	71 U	71	18, p. 52; 76, p. 8; 85, pp. 1-2, 5, 47
SD-51C (A4C24)	PCBs (Aroclor 1242)	53 U	53	18, p. 54; 77, p. 8; 86, pp. 1-2, 7, 93
SD-52C (A4C27)	PCBs (Aroclor 1242)	45 U	45	18, p. 57; 77, p. 8; 86, pp. 1-2, 7, 96
SD-53A (A4C29)	PCBs (Aroclor 1242)	71 U	71	18, p. 58; 77, p. 9; 86, pp. 1-2, 8, 98
SD-54C (A4C26)	PCBs (Aroclor 1242)	45 U	45	18, p. 63; 77, p. 8; 86, pp. 1-2, 7, 95

U = Value is non-detected [76, p. 8; 77, pp. 8-9].

CRQL = Contract-required Quantitation Limit is the substance specific level that a Contract Laboratory Program (CLP) laboratory must be able to routinely and reliably detect. Used here, the CRQL has been adjusted per the CLP Scope of Work SOM01.2 and represents a sample specific quantitation limit [1, pp. 51585, 51589; 76; 77; 85; 86]

The background sediment samples were used to establish background conditions and chemical compositions of the sediment materials within the vicinity of the Jard property, and to establish the range of concentrations for PCBs (analyzed as Aroclor 1242) in local sediments for the ground water to surface water component of the Jard SWP. Analytical results of the background sediment samples are presented to establish representative background concentrations for PCBs (analyzed as Aroclor 1242), which are used to demonstrate that significant concentrations of these hazardous substances have been detected in the eight contaminated sediment samples collected from the wetland located west of the Jard property.

- Contaminated Samples:

On 16 April 2013, as part of the EPA SR and in accordance with the EPA-approved February 2013 Site-Specific QAPP, sediment sampling activities were conducted along the SWP and within the HRS-eligible wetland located west-northwest of the Jard property [4, pp. 54-61, 63-64; 9, pp. 1, 29-32, 39; 10, pp. 35-38, 46-47, 54-55, 57-58, 74, 75; 12, pp. 2-4, 14]. Eight contaminated sediment samples (SD-31A, SD-32A, SD-36A, SD-39A, SD-41A, SD-46A, SD-47A, and SD-49A) were collected, at depths down to 1 foot below the water/sediment interface, from the Unnamed Stream and associated wetlands (see Figure 6B) [4, pp. 56-58; 18, pp. 25, 27, 31, 35, 37, 43, 44, 48].

Surface Water Migration Pathway
Ground Water to Surface Water Component
Likelihood of Release

Table 26 – Contaminated Sediment Sample Location Descriptions

Sample ID	Sample Medium	Sample Location	Distance from PPE (feet)	Depth* (inches)	Date	References
SD-31A (A4C08)	Sediment	Sediment / PPE sample located on northwestern corner of residential property P011 at headwaters of “Unnamed Stream”.	12.1	0 to 12	4/16/2013	4, pp. 58, 63, 71-72; 10, p. 69, 74; 18, p. 25; 102, p.3
SD-32A (A4C07)	Sediment	Sediment located along “Unnamed Stream” on northwestern corner of residential property P011.	41.2	0 to 12	4/16/2013	4, pp. 58, 63; 10, p. 69, 74; 18, p. 27; 102, p.3
SD-36A (A4C06)	Sediment	Sediment located along “Unnamed Stream” on residential property P006.	531.7	0 to 12	4/16/2013	4, pp. 57, 63; 10, p. 69, 74; 18, p. 31; 102, p.3
SD-39A (A4C05)	Sediment	Sediment located along “Unnamed Stream” on property P041.	760.3	0 to 8	4/16/2013	4, pp. 57, 64; 10, p. 69, 74; 18, p. 35; 102, p.3
SD-41A (A4C04)	Wetland Sediment	Sediment located along “Unnamed Stream” in east-central portion of property P030, west of Park Street and property P041.	1005.8	0 to 12	4/16/2013	4, pp. 57, 64; 10, p. 69, 74; 18, p. 37; 102, p.3
SD-46A (A4C10)	Wetland Sediment	Sediment located along “Unnamed Stream” in north-central portion of property P030, west of Park Street.	1374.4	0 to 12	4/16/2013	4, pp. 56, 64; 10, pp. 69, 74; 18, p. 43; 102, p.3
SD-47A (A4C09)	Wetland Sediment	Sediment located along “Unnamed Stream” in north-central portion of property P030, west of Park Street.	1492.7	0 to 12	4/16/2013	4, pp. 56, 64; 10, p. 69, 74; 18, p. 44; 102, p.3
SD-49A (A4C01)	Wetland Sediment	Sediment located along “Unnamed Stream” in northwestern portion of property P030, west of Park Street.	1626.2	0 to 12	4/16/2013	4, pp. 56, 64; 10, p. 69, 74; 18, p. 48; 102, p.3

* Depth below water/sediment interface

The eight contaminated sediment samples collected as part of the EPA SR contained varying compositions of naturally occurring native matrix materials which were similar to the five background sediment samples presented earlier (see Tables 26 and 29) [4, pp. 54-61, 63-64; 18, pp. 25, 27, 31, 35, 37, 43, 44, 48, 52, 54, 57, 58, 63; 78]. The eight contaminated sediment samples were collected from the SWP, during the same time period and from similar depths, and using the same collection and analytical methods as the five background

sediment samples presented above [4, pp. 54-61, 63-64, 71-72; 11, pp. 13-14, 16; 18, p. 25, 27, 31, 35, 37, 43, 44, 48, 52, 54, 57, 58, 63; 75, pp. 1-5; 76, pp. 1-4; 77, pp. 1-4].

Table 27 – Contaminated Sediment Sample Matrix Description		
Sample ID	Sample Description	Reference
SD-31A (A4C08)	Saturated, brown, fine to medium SAND, some silt, some fine to medium gravel, trace coarse sand, trace organics, trace clay.	18, p. 25
SD-32A (A4C07)	Saturated, dark brown, SILT, some organics, little fine to coarse sand, trace clay, trace fine gravel.	18, p. 27
SD-36A (A4C06)	Saturated, dark brown, SILT, some organics, trace clay, trace fine to coarse sand.	18, p. 31
SD-39A (A4C05)	Saturated, dark brown, SILT, little fine to medium gravel, little organic debris (pine needles, bark, and wood chips), trace clay, trace fine to coarse sand.	18, p. 35
SD-41A (A4C04)	Saturated, dark brown, fine to coarse SAND and SILT, little fine to medium gravel, trace clay, trace organics.	18, p. 37
SD-46A (A4C10)	Moist, brown, fine to coarse SAND, some fine to medium gravel, trace silt, trace debris (plastic sheeting), trace organics, trace clay.	18, p. 43
SD-47A (A4C09)	Moist, dark brown, SILT, some clay, some fine to medium sand, trace coarse sand, trace fine gravel, trace organics.	18, p. 44
SD-49A (A4C01)	Wet, dark brown, SILT, some organics, trace clay, trace fine to coarse sand.	18, p. 48

The eight contaminated sediment samples were submitted to a CLP laboratory (Chemtech Consulting Group) for analysis of low/medium Aroclor compounds following SOW SOM1.2, and the data were validated at the Tier II level by personnel not involved with the sediment sampling event and according to Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses and the USEPA CLP National Functional Guidelines for Superfund Organic Method [4, pp. 56-58, 61, 63-64; 11, pp. 13-14; 18, pp. 25, 27, 31, 35, 37, 43, 44, 48; 75, pp. 1-5, 9,10].

Aroclor 1242 was detected in contaminated sediment samples at concentrations above each sample-adjusted CRQL, and above the background concentrations established by analytical results of background samples, thereby establishing observed release of Aroclor 1242 (PCBs) to the SWP via chemical analysis [1, p. 51589 (Table 2-3); 75, pp. 9-10; 76, p. 8; 77, pp. 8-9; 84, pp. 8-9, 76, 79-85; 85, p. 5; 86, pp. 7-8].

Table 28 - Hazardous Substances Associated with Contaminated Sediment Samples				
Sample ID	Hazardous Substance	Concentration (µg/Kg)	Sample-Adjusted CRQL (µg/Kg)	References
SD-31A (A4C08)	PCBs (Aroclor 1242)	230	42	18, p. 25; 75, p. 10; 84, pp. 1-2, 9, 83
SD-32A (A4C07)	PCBs (Aroclor 1242)	470	50	18, p. 27; 75, p. 9; 84, pp. 1-2, 8, 82
SD-36A (A4C06)	PCBs (Aroclor 1242)	100	58	18, p. 31; 75, p. 9; 84, pp. 1-2, 8, 81

Table 28 - Hazardous Substances Associated with Contaminated Sediment Samples

SD-39A (A4C05)	PCBs (Aroclor 1242)	98	88	18, p. 35; 75, p. 9; 84, pp. 1-2, 8, 80
SD-41A (A4C04)	PCBs (Aroclor 1242)	250	42	18, p. 37; 75, p. 9; 84, pp. 1-2, 8, 79
SD-46A (A4C10)	PCBs (Aroclor 1242)	220	40	18, p. 43; 75, p. 10; 84, pp. 1-2, 9, 85
SD-47A (A4C09)	PCBs (Aroclor 1242)	87	47	18, p. 44; 75, p. 10; 84, pp. 1-2, 9, 84
SD-49A (A4C01)	PCBs (Aroclor 1242)	320	54	18, p. 48; 75, p. 9; 84, pp. 1-2, 8, 76

CRQL = Contract-required Quantitation Limit is the substance specific level that a Contract Laboratory Program (CLP) laboratory must be able to routinely and reliably detect. Used here, the CRQL has been adjusted per the CLP Scope of Work SOM01.2 and represents a sample specific quantitation limit [1, pp. 51585, 51589; 75; 84]

Attribution:

The operational and investigative history of the Jard property has documented use and release of PCBs into the environment (see Site Summary Section). Chemical analysis of samples collected from Source Nos. 1 and 2 has documented the presence of the hazardous substances (see Source Characterization Sections). Chemical analysis of ground water samples collected from monitoring wells and piezometers as part of numerous investigations has indicated the presence of PCB contamination in the overburden aquifer in proximity to the Jard property as discussed in the Ground Water Migration Pathway section of this documentation record (see Section 3.1.1).

Investigations completed by The Johnson Company in 2010 and 2012 indicated that water levels in the piezometers installed in Greene Pond (PPE for the Jard SWP) and Duck Pond (downstream of PPE) indicated an upward vertical gradient, indicating gaining (receiving ground water) conditions within these surface water bodies via ground water to surface water flow [65, pp. 28, 44, 45; 68 pp. 3, 7, 8, 19; 101, pp. 1-3]. The Johnson Company 2010 Limited Phase II ESA Report noted that the conclusion of gaining conditions at these surface water bodies was further supported by the presence of seeps near the base of the slope above Duck Pond [65, p. 28].

Chemical analysis of eight sediment samples (SD-31A, SD-32A, SD-36A, SD-39A, SD-41A, SD-46A, SD-47A, and SD-49A) establish an observed release of PCBs (analyzed as Aroclor 1242) to the SWP along the Unnamed Stream from the PPE to SD-49, located 0.308 miles downstream of the PPE [1, p. 51589 (Table 2-3); 75, pp. 9-10; 76, p. 8; 77, pp. 8-9; 84, pp. 8-9, 76, 79-85; 85, p. 5; 86, pp. 7-8; 102, p. 3]. Chemical analysis of four sediment samples (SD-41A, SD-46A, SD-47A, and SD-49A), collected from the HRS-eligible wetland along the Unnamed Stream west-northwest of the Jard property, meet the criteria for observed release and documentation of actual contamination of PCBs (analyzed as Aroclor 1242) to an Environmental Threat Target [4, pp. 56-57, 61, 64; 18, pp. 37, 43, 44, 48; 12, pp. 3-4, 14; 102, p. 5]. The presence of PCBs (analyzed as Aroclor 1242) at elevated concentrations in Source Nos. 1 and 2, and the documentation via chemical analysis of an observed release of these substances to the wetland along the Unnamed Stream west-northwest of the Jard property, support at least partial attribution of the hazardous substances to releases from the Jard site [1, p. 51588 (Section 2.2.2)]. The hazardous substances used to establish an observed release (PCBs) are associated

with the Jard site, and the site has contributed at least in part to the significant increase in hazardous substance concentrations.

START personnel did not observe any additional possible sources of observed releases of hazardous substances along the Unnamed Stream segment (from the SWP PPE to the confluence with Furnace Brook) evaluated as part of this HRS Documentation Record [4, p. 71]. The stream segment evaluated as part of the documentation record generally flows adjacent to or through residential or undeveloped properties [4, p. 71]. Observations and Discussions with residents during the EPA SR, along with documentation from The Johnson Company Phase II ESA indicate that ground water occasionally infiltrates residential foundations/basements through seeps [4, p. 28, 35, 43, 46, 51, 69, 68; 65, p. 22, 35]. Infiltrated ground water from basements drains connected to sump pumps direct the water to ground surface areas and potentially into the Unnamed Stream and wetlands west of Park Street [4, p. 68-69; 61, pp. 4-5; 65, p. 22, 35]. Other possible sources of releases were investigated through review of file information and observations made during field activities (see Section 3.1.1 – Attribution – Other Possible Sites).

Specific Hazardous Substances Meeting Criteria for Observed Release to Surface Water In-water Segment:

PCBs (analyzed as Aroclor 1242)

4.2.2.1.1 Observed Release

A ground water observed release of PCBs has been documented in section 3.1.1 of this HRS documentation record. Therefore, according to Section 4.2.2.1.1 of the HRS, a 550 is assigned on line 1 of Table 4-25 (the HRS Ground Water to Surface Water Migration Component Scoresheet).

Hazardous Substances Meeting Criteria for Observed Release to Ground Water:

PCBs (analyzed as Aroclor 1242)

Observed Release Factor Value: 550

4.2.2.1.2 Potential to Release

An observed release to ground water was documented through chemical analysis; therefore, potential to release was not evaluated.

4.2.2.2 Drinking Water Threat Waste Characteristics

Drinking Water Threat Targets have not been identified for the ground water to surface water flow component for the Surface Water Pathway; therefore, the Drinking Water Threat has not been evaluated as part of this HRS Documentation Record.

4.2.3.2 Human Food Chain Threat Waste Characteristics

A Human Food Chain Threat Target, fishery, has been identified and documented for the surface water migration pathway ground water to surface water flow component, evaluated below as part of this HRS documentation record.

4.2.3.2.1 Toxicity/Mobility/Persistence/Bioaccumulation

Listed below are the hazardous substances for which an observed release to surface water via ground water to surface water component has been documented (see Section 4.2.1.3 of this Evaluation) and are associated with sources having a ground water containment factor value greater than 0 (see Sections 2.2.2, 2.2.3 and 3.1.1 of this Evaluation).

The Toxicity Factor Value, the Persistence Factor Value, and the Bioaccumulation Factor Value are assigned to the hazardous substances associated with the sources and releases at the Jard site [2, pp. 1 -2]. Since the downstream hazardous substance migration pathway is comprised of fresh water riverine environments, the toxicity and bioaccumulation factor values for fresh water, and the persistence values for rivers are used.

Table 29 – Ecosystem Toxicity/Mobility/Persistence/Bioaccumulation

Hazardous Substance	Source No.	Toxicity Factor Value	Mobility Factor Value*	Toxicity/Mobility Factor Value [1, Table 3-9]	Persistence Factor Value**	Toxicity/Mobility/Persistence Factor Value [1, Table 4-26]	References
PCBs, (analyzed as Aroclors 1016 and 1242)	1, 2	10,000	1	10,000	1	10,000	1, pp. 51602 (Table 3-9), 51630 (Table 4-26); 2, pp. 1-2

* For any hazardous substance that meets the criteria for an observed release by chemical analysis to one or more aquifers underlying the sources at the site, regardless of the aquifer being evaluated, assign a mobility factor value of 1 [1, pp. 51601 (Section 3.2.1.2), 51629 (Section 4.2.2.2.1.2)].

** Persistence value for Rivers.

From HRS Table 4-26, a Toxicity/Mobility Factor Value of 10,000 and a Persistence Factor Value of 1 for PCBs results in an Toxicity/Mobility/Persistence Factor Value of 10,000 [1, p. 51630; 2, pp. 1-2].

Table 30 - Toxicity/Mobility/Persistence/Ecosystem Bioaccumulation Factor Value				
Hazardous Substance	Ecosystem Toxicity/Mobility/Persistence Factor Value	Bioaccumulation Factor Value*	Toxicity/Mobility/Persistence/Bioaccumulation Factor Value [1, Table 4-28]	References
PCBs (Aroclor 1242)	10,000	50,000	5×10^8	1, p. 51633; 2, pp. 1-2

* Bioaccumulation Factor value for fresh water

From HRS Table 4-28, a Toxicity/Mobility/Persistence Factor Value of 10,000 and a Bioaccumulation Factor Value of 50,000 for PCBs results in an Toxicity/Mobility/Persistence/ Bioaccumulation Factor Value of 5×10^8 [1, p. 51633; 2, pp. 1-2].

Toxicity/Mobility/Persistence/ Ecosystem Bioaccumulation Factor Value: 5×10^8

4.2.3.2.2 Hazardous Waste Quantity

Table 31 – Hazardous Waste Quantity		
Source No.	Source Type	Source Hazardous Waste Quantity
1	Contaminated Soil	3.14
2	Pile	13,300

Sum of Values: 13,303.14

Based on HRS Section 2.4.2.2, if the Hazardous Constituent Quantity is not adequately determined for one or more sources and if any target for the SWP is subject to Level I or Level II concentrations, a factor value is assigned from Table 2-6, or a value of 100, whichever is greater, as the Hazardous Waste Quantity Factor Value for that pathway [1, pp. 51591-51592 (Section 2.4.2.2)].

Hazardous Waste Quantity Factor Value [1, Table 2-6]: 10,000

4.2.3.2.3 Waste Characteristics Factor Category Value

The Toxicity Factor Value (10,000) and Mobility Factor Value (1.0) for PCBs are multiplied in order to determine the Toxicity/Mobility Factor Value (10,000) [1, p. 51602 (Section 3.2.1.3, Table 3-9)]. The Toxicity/Mobility Factor Value (10,000) and the Persistence Factor Value (1.0) for PCBs are multiplied in order to determine the Toxicity/Mobility/Persistence Factor Value (10,000) [1, pp. 51629- (Section 4.2.2.2.1.4), 51630 (Table 4-26)]. The Toxicity/Mobility/Persistence Factor Value for the watershed (10,000) is multiplied by the Hazardous Waste Quantity Factor Value for the watershed (10,000) in order to determine the Waste Characteristics Product, subject to a maximum value of 1×10^8 [1, pp. 51590 (Section 2.4.1.2), 51591 (Section 2.4.2.2), 51592 (Section 2.4.3.2), 51624 (Section 4.1.4.2.3)]. $10,000 \times 10,000 = 1 \times 10^8$.

Toxicity/Mobility/Persistence Factor Value: 10,000

Hazardous Waste Quantity Factor Value: 10,000

Toxicity/Mobility/Persistence Factor Value x Hazardous Waste Quantity Factor Value: 1×10^8

Bioaccumulation Potential Factor Value: 50,000

The product of the Toxicity/Mobility/Persistence Factor Value and the Hazardous Waste Quantity Factor Value (equal to 1×10^8) is multiplied by the Bioaccumulation Potential Factor Value (50,000) for PCBs in order to determine the Waste Characteristics Factor Category Value, subject to a maximum product of 1×10^{12} [1, pp. 51638 (Section 4.2.4.2.1.5), 51592 (Section 2.4.3.2, Table 2-7)]. $1 \times 10^8 \times 50,000 = 5 \times 10^{12}$. However, since the value exceeds maximum product value, the value of 1×10^{12} is assigned.

(Toxicity/Mobility/Persistence Factor Value \times Hazardous Waste Quantity Factor Value) \times Bioaccumulation Potential Factor Value: 1×10^{12}

Based on the Waste Characteristics Factor Category Value (1×10^{12}) and HRS Table 2-7, the Waste Characteristics Factor Category for the Watershed is 1,000 [1, p. 51592 (Section 2.4.3.2, Table 2-7)].

Waste Characteristics Factor Category Value [1, Table 2-7]: 1,000

4.2.3.3 Human Food Chain Threat Targets

An interview with a local professional fishing guide, catering to fly-, spin-, and ice-anglers in Vermont, confirmed the presence of a recreational fishery occurring in the Walloomsac River in Bennington, Vermont [132, p. 1]. According to the interviewed fishing guide, trout are harvested from the Walloomsac River and consumed by people living in the local area [132, p. 1]. The fishing guide observed fish being taken from access points at the Hunt Street Bridge, behind the McDonald's Restaurant; the Silk Street Covered Bridge; and the Henry Covered Bridges [132, p. 1]. In addition, according to a Vermont Fish and Wildlife Fisheries Biologist, it is highly likely that people consume fish caught in the Walloomsac River [131, p.1]. Furthermore, according to a Vermont Fish & Wildlife Department News Release; a section of the Walloomsac River extending from the Vermont/New York border in Bennington, upstream to the top of the former Vermont Tissue Plant Dam (downstream of Murphy Road) in Bennington, has been added to the trophy trout streams stocked with two-year old brown or rainbow trout with a daily limit of two trout per day [130, p. 1]. The new release notes that this section of the Walloomsac River is open to trout fishing year round according to the following rules: only artificial flies or lures may be used, except during the open season for trout (2nd Saturday in April to October 31); catch and release only (trout must be immediately released where caught), except during the open season for trout; and during open season for trout, follow normal size restrictions, daily limits and possession limits [130, p.1]. The annual harvest information for the above species was not found in available file information, but is greater than zero (> 0) pounds based on the documentation of the interviewed local professional fishing guide observing people harvesting fish from the fishery.

4.2.3.3.1 Food Chain Individual

Data is not available to support that the Walloomsac River fishery is subject to actual contamination, Level I or Level II concentrations; however, there is an observed release of hazardous substances (PCBs), having a Bioaccumulation Factor Value of 500 or greater to the in-water segment for the watershed; and there is a fishery present within the TDL (See Section 4.2.1.3 and Section 4.2.3.3 of this Evaluation). Therefore, the fishery in Walloomsac River is evaluated as subject to potential human food chain contamination [1, p. 51638 (Section 4.2.3.3)]. As a result, a Food Chain Individual Factor Value of 20 is assigned [1, p. 51638 (Section 4.2.3.3.1)].

Sample ID: SD-32 (A4C07)

Level I/Level II/or Potential Contamination: Potential Contamination

Hazardous Substance: PCBs (analyzed as Aroclor 1242)

Bioaccumulation Potential: 50,000

Food Chain Individual Factor Value: 20

4.2.3.3.2 Population

4.2.3.3.2.3 Potential Human Food Chain Contamination

An interview with a local professional fishing guide confirmed the presence of a trout fishery occurring in the Walloomsac River in Bennington, Vermont [130, p. 1; 132, p. 1].

Potential Population Targets

The annual harvest information for the Walloomsac River fishery was not found in available file information, but is greater than zero (> 0) pounds based on the documentation of the interviewed local professional fishing guide observing people harvesting fish from the fishery. Based on the drainage basin area, the Walloomsac River has an estimated flow rate, in the reach documented as a fishery, of greater than 100 cubic feet per second [134]. Based on these estimated calculations, the Walloomsac River is classified as a moderate to large stream and is assigned a dilution weight of 0.01 [1, p. 51613 (Table 4-13); 134]. A Dilution Weight Adjustment Value was assigned based on the theta angle (212 degrees) from site sources to the intersection of the surface water body within 1 radial-mile [1, p. 51631 (Section 4.2.2.3.1 and Table 4-27); 135]. Therefore, the potential food chain contamination factor value for the potential population is 0.000018.

Table 32 - Potential Food Chain Contamination Factor Value

Identity of Fishery	Annual Production (pounds)	Type of Surface Water Body	Average Annual Flow (cfs)	References	Population Value (P_i) [1, Table 4-18]	Dilution Weight (D_i) [1, Table 4-13]	Dilution Weight Adjustment Value (A) [1, Table 4-27]	$P_i \times (D_i \times A)$
Walloomsac River	> 0	Moderate to Large Stream	> 100 to 288	130, p. 1; 132, p. 1; 134; 135	0.03	0.01	0.6	0.00018

Sum of $P_i \times (D_i \times A)$: 0.00018

(Sum of $P_i \times [D_i \times A]$)/10: 0.000018 [1, p. 51621 (Section 4.1.3.3.2.3)]

Potential Human Food Chain Contamination Factor Value: 0.000018

4.2.4.2 Environmental Threat Waste Characteristics

An Environmental Threat Target, HRS-eligible wetland frontage, has been identified and documented for the surface water migration pathway ground water to surface water flow component, evaluated below as part of this HRS Documentation Record.

4.2.4.2.1 Ecosystem Toxicity/Mobility/Persistence/Bioaccumulation

Table 33 – Ecosystem Toxicity/Mobility/Persistence/Bioaccumulation							
Hazardous Substance	Source No.	Ecosystem Toxicity Factor Value	Mobility Factor Value*	Ecosystem Toxicity/Mobility Factor Value [1, Table 3-9]	Persistence Factor Value**	Ecosystem Toxicity/Mobility/Persistence Factor Value [1, Table 4-29]	References
PCBs (Aroclor 1242)	1, 2	10,000	1	10,000	1	10,000	1, pp. 51602, 51639; 2, pp. 1-2

* For any hazardous substance that meets the criteria for an observed release by chemical analysis to one or more aquifers underlying the sources at the site, regardless of the aquifer being evaluated, assign a mobility factor value of 1 [1, pp. 51601 (Section 3.2.1.2), 51629 (Section 4.2.2.2.1.2)].

** Persistence value for Rivers.

From HRS Table 4-29, an Ecosystem Toxicity/Mobility Factor Value of 10,000 and a Persistence Factor Value of 1 for PCBs results in an Ecosystem Toxicity/Mobility/Persistence Factor Value of 10,000 [1, p. 51639; 2, pp. 1-2].

Table 34 - Ecosystem Toxicity/Mobility/Persistence/Ecosystem Bioaccumulation Factor Value				
Hazardous Substance	Ecosystem Toxicity/Mobility/Persistence Factor Value	Ecosystem Bioaccumulation Factor Value*	Ecosystem Toxicity/Mobility/Persistence/Ecosystem Bioaccumulation Factor Value [1, Table 4-30]	References
PCBs (Aroclor 1242)	10,000	50,000	5×10^8	1, pp. 51639-51640; 2, pp. 1-2

* Ecosystem Bioaccumulation Factor value for fresh water

From HRS Table 4-30, an Ecosystem Toxicity/Mobility/Persistence Factor Value of 10,000 and an Ecosystem Bioaccumulation Factor Value of 50,000 for PCBs results in an Ecosystem Toxicity/Mobility/Persistence/Bioaccumulation Factor Value of 5×10^8 [1, p. 51640; 2, pp. 1-2].

Ecosystem Toxicity/Mobility/Persistence/ Ecosystem Bioaccumulation Factor Value: 5×10^8

4.2.4.2.2 Hazardous Waste Quantity

Table 35 – Hazardous Waste Quantity		
Source No.	Source Type	Source Hazardous Waste Quantity
1	Contaminated Soil	3.14
2	Pile	13,300

Sum of Values: 13,303.14

Based on HRS Section 2.4.2.2, if the Hazardous Constituent Quantity is not adequately determined for one or more sources and if any target for the SWP is subject to Level I or Level II concentrations, a factor value is assigned from Table 2-6, or a value of 100, whichever is greater, as the Hazardous Waste Quantity Factor Value for that pathway [1, pp. 51591-51592 (Section 2.4.2.2)].

Hazardous Waste Quantity Factor Value [1, Table 2-6]: 10,000

4.2.4.2.3 Waste Characteristics Factor Category Value

The Ecosystem Toxicity Factor Value (10,000) and Mobility Factor Value (1.0) for PCBs are multiplied in order to determine the Ecosystem Toxicity/Mobility Factor Value (10,000) [1, pp. 51602 (Section 3.2.1.3, Table 3-9)]. The Ecosystem Toxicity/Mobility Factor Value (10,000) and the Persistence Factor Value (1.0) for PCBs are multiplied in order to determine the Ecosystem Toxicity/Mobility/Persistence Factor Value (10,000) [1, pp. 51638-51639 (Section 4.1.4.2.1.5, Table 4-29)]. The Ecosystem Toxicity/Mobility/Persistence Factor Value for the watershed (10,000) is multiplied by the Hazardous Waste Quantity Factor Value for the watershed (10,000) in order to determine the Waste Characteristics Product, subject to a maximum value of 1×10^8 [1, pp. 51590 (Section 2.4.1.2), 51591 (Section 2.4.2.2), 51592 (Section 2.4.3.2), 51624 (Section 4.1.4.2.3)]. $10,000 \times 10,000 = 1 \times 10^8$.

Ecosystem Toxicity/Mobility/Persistence Factor Value: 10,000

Hazardous Waste Quantity Factor Value: 10,000

Ecosystem Toxicity/Mobility/Persistence Factor Value x Hazardous Waste Quantity Factor Value: 1×10^8

Ecosystem Bioaccumulation Potential Factor Value: 50,000

The product of the Ecosystem Toxicity/Mobility/Persistence Factor Value and the Hazardous Waste Quantity Factor Value (equal to 1×10^8) is multiplied by the Bioaccumulation Potential Factor Value (50,000) for PCBs in order to determine the Waste Characteristics Factor Category Value, subject to a maximum product of 1×10^{12} [1, pp. 51638 Section 4.2.4.2.1.5; 51592 (Section 2.4.3.2, Table 2-7)]. $1 \times 10^8 \times 50,000 = 5 \times 10^{12}$. However, since the value exceeds maximum product value, the value of 1×10^{12} is assigned.

(Ecosystem Toxicity/Mobility/Persistence Factor Value \times Hazardous Waste Quantity Factor Value) \times
Ecosystem Bioaccumulation Potential Factor Value: 1×10^{12}

Based on the Waste Characteristics Factor Category Value (1×10^{12}) and HRS Table 2-7, the Waste Characteristics Factor Category for the Watershed is 1,000 [1, p. 51592 (Section 2.4.3.2, Table 2-7)].

Waste Characteristics Factor Category Value [1, Table 2-7]: 1,000

4.2.4.3 Environmental Threat Targets

On 5 April 2013, VT ANR DEC District Wetlands Ecologist and START examined and documented the wetland area along the Jard SWP extending downstream of the PPE to Furnace Brook (see Figure 6B) [4, pp. 19-21; 12, pp. 1, 3 -4]. The results of the wetland delineation activities indicated that the shape of the wetland area delineated by North Country Ecological Services in June 2002 was generally consistent with what was observed in the field in April 2013 [4, pp. 20-21; 12, p. 3]. During delineation activities in April 2013, various wetland types were identified and documented within this wetland area [4, p. 20; 12, p. 3]. The VT ANR DEC District Wetlands Ecologist noted that there were HRS-eligible wetland fringes [Palustrine Emergent Marsh (PEM) and Palustrine Scrub-Shrub (PSS)] lining the banks of the Unnamed Stream on Property P030, located west of Park Street and west-northwest of the Jard property [4, pp. 20-21; 12, pp. 4]. The results of the wetland delineation documented the presence of continuous HRS-eligible (PEM) wetlands on both sides of this stream segment, between the point where the Unnamed Stream flows onto Property P030 and the most downstream sediment sample location, SD-49 [4, pp. 20, 71; 12, p. 4]. The calculated wetland perimeter frontage downstream of the PPE along this segment is 0.2546 miles [12, p. 4].

On 5 April 2013, the VT ANR DEC District Wetlands Ecologist and START also evaluated the “Background Wetland” located to the northeast of the Jard property [4, pp. 20-21; 12, p. 1]. This wetland area had been previously documented on the United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) map as P SS1B (Palustrine Scrub-Shrub Broad-Leaved Deciduous Saturated) and on Vermont Geographic Information System (GIS) documents as VT ANR Class 2 Wetlands and Hydric soil areas [4, p. 21; 12, pp. 2-3]. The District Wetlands Ecologist and START personnel identified and outlined eligible HRS-eligible wetland types with wetland characteristics similar to those identified in the release wetland area located on Property P030 [4, p. 21; 12, pp. 2, 6].

On 16 April 2013, as part of the EPA SR and in accordance with the EPA-approved February 2013 Site-Specific QAPP, eight sediment samples (SD-31A, SD-32A, SD-36A, SD-39A, SD-41A, SD-46A, SD-47A, and SD-49A) were collected along the Jard SWP [4, pp. 56-58; 9, pp. 1, 29-32, 39; 18, pp. 25, 27, 31, 35, 37, 43, 44, 48]. Analytical results of four of those sediment samples (SD-49A, SD-47A, SD-46A, and SD-41A) document an observed release of PCBs (analyzed as Aroclor 1242) to the HRS-eligible wetland along the Unnamed Stream west-northwest of the Jard property [4, pp. 56-57, 64; 12, pp. 3-4, 14; 18, pp. 37, 43, 44, 48; 75, pp. 9-10; 84, pp. 8-9, 76, 79, 84-85; 102, p. 5]. Sediment sample SD-49A was collected at a location 0.308 miles downstream of the most upstream PPE for the SWP [102, pp. 2, 5]. The analytical results of each contaminated sediment sample were compared to the contaminant concentrations detected only in those background sediment samples which displayed the most similar matrix composition [78]. As noted above in Section 4.2.1.3. of this HRS Documentation Record, Aroclor 1242 was detected in sediment samples SD-41A, SD-46A, SD-47A, and SD-49A at concentrations above each sample-adjusted CRQL, and above the background concentrations established by analytical results of background samples (SD-51A, SD-51C, SD-52C, SD-54C), thereby establishing an observed release of PCBs (analyzed as Aroclor 1242) to the SWP via chemical analysis [1, p. 51589 (Table 2-3); 75, pp. 9-10; 76, p. 8; 77, pp. 8-9; 84, p. 8, 9, 76, 79, 84, 85; 85, pp. 4-5, 47]. For the purposes of this HRS Documentation Record, only the downstream wetland perimeter frontage extending from the point where the Unnamed Stream flows onto Property P030 (0.0105 miles upstream of SD-41) to sediment sample location SD-49A is evaluated to document actual contamination to greater than 0.1 miles of wetland perimeter frontage.

Table 36 – Contaminated Sediment Samples and Benchmark Concentrations						
Sample ID	Sample Medium	Hazardous Substance	Hazardous Substance Concentration (µg/Kg)	Benchmark Concentration	Benchmark	References
SD-41A (A4C04)	Sediment	PCBs (Aroclor 1242)	250	N/A	N/A	2, p.2; 18, p. 37; 75, p. 9; 84, pp. 5, 8, 79
SD-46A (A4C10)	Sediment	PCBs (Aroclor 1242)	220	N/A	N/A	2, p.2; 18, p. 43; 75, p. 10; 84, pp. 6, 9, 85
SD-47A (A4C09)	Sediment	PCBs (Aroclor 1242)	87	N/A	N/A	2, p.2; 18, p. 44; 75, p. 10; 84, pp. 6, 9, 84
SD-49A (A4C01)	Sediment	PCBs (Aroclor 1242)	320	N/A	N/A	2, p.2; 18, p. 48; 75, p. 9; 84, pp. 5, 8, 76

N/A = Not Applicable.

The observed release to sediment from sources associated with the Jard property is established by sediment sample analytical results [1, p. 51589 (Table 2-3); 75, pp. 9-10; 76, p. 8; 77, pp. 8-9; 84, pp. 5, 6, 8, 9, 76, 79, 84, 85; 85, pp. 4-5, 47]. Sensitive environments that are determined to be actual contamination targets based on sediment sample analytical results, but for which no ecological-based benchmarks are applicable, are evaluated as subject to actual contamination at Level II [1, p. 51625 (Section 4.1.4.3.1)].

Most Distant Level II Sample

Sample ID: SD-49A

Distance from the probable point of entry: 0.3080 miles

Reference: 102, pp. 2-3

4.2.4.3.1 Sensitive Environments

4.2.4.3.1.1 Level I Concentrations

Level I Sensitive Environment Targets

The observed release to sediment from sources associated with the Jard property is established by sediment sample analytical results (see Section 4.2.1.3). No Level I sensitive environments have been identified.

Sum of Level I Wetland Frontages: 0

Wetland Value [1, Table 4-24]:

Sum of Level I Sensitive Environments Value + Wetlands Value: 0

(Sum of Level I Sensitive Environments Value + Wetlands Value) x 10: 0

Sum of Level I Sensitive Environments Value: 0

Level I Concentrations Factor Value: 0

4.2.4.3.1.2 Level II Concentrations

Level II Sensitive Environment Targets

One sensitive environment, an HRS-eligible wetland located along the Unnamed Stream, west of the Jard property and extending to sediment sample location SD-49, which was determined to be an actual contamination target based on chemical analysis of sediment samples, is evaluated at Level II concentrations [1, p. 51644 (Section 4.2.4.3.1)]. An observed release to sediment from sources associated with the Jard property has been established for the documented wetland located along the Unnamed Stream, which encompassed 0.2546 miles of wetland perimeter frontage downstream of the PPE [12, p. 4; 75, pp. 9-10; 76, p. 8; 77, pp. 8-9; 84, pp. 8, 9, 76, 79, 84, 85; 85, pp. 4-5, 47; 86, pp. 7-8, 93, 95-96, 98]. No other sensitive environments were evaluated along the TDL for the surface water migration pathway for the Jard site.

Level II Wetland Frontages

Based on the results of the 5 April 2013 wetland delineation activities completed by VT ANR DEC District Wetlands Ecologist and START personnel, there are 2.36258 acres of HRS-eligible wetlands (PEM and PSS) [in accordance with the definition of a wetland presented in 40 Code of Federal Regulations (CFR) 230.3] located on the undeveloped property (identified as P030) located west of the residential properties along Park Street and along the Unnamed Stream, extending from 0.0105 miles upstream of SD-41A to 0.0254 miles downstream of sediment location SD-49 [1, p. 51625 (Section 4.1.4.3.1.1, Table 4-24); 4, p. 20; 12, pp. 2-4, 35; 102, pp. 1-2]. In addition, the VT ANR DEC District Wetlands Ecologist noted that there were possibly additional wetland areas located on property P030 and along portions of the Unnamed Stream upstream of the eastern border of P030 to the PPE and sediment sample point SD-30 [4, p. 20; 12, p. 4]. The VT ANR DEC District Wetland Ecologist noted that more extensive investigation would be required to document the possible HRS-eligible wetlands [1, p. 51625 (Section 4.1.4.3.1.1, Table 4-24); 4, p. 20; 12, p. 4]. Field observations by the VT ANR DEC District Wetlands Ecologist indicated that HRS-eligible wetlands, specifically PEM and PSS, border both sides of the Unnamed Stream channel from 0.0105 miles upstream of SD-41 to 0.0246 miles downstream of sediment location SD-49 [12, pp. 4, 6; 4, p. 20; 102, pp. 1-2]. The documented HRS-eligible wetland perimeter frontage encompassing the channel downstream of the PPE (Greene Pond – SD-30 and SD-31) to sample location SD-49A is 0.2546 miles in length [12, p. 4]. For the purposes of this HRS Documentation Record, only the HRS-eligible wetlands located along the Unnamed Stream channel between 0.0105 miles upstream of SD-41 (P030 property boundary) to 0.0246 miles downstream of sediment location SD-49, located west of the Jard property, and subject to actual contamination are evaluated to document actual contamination to greater than 0.1 miles of wetland perimeter frontage.

PCBs (analyzed as Aroclor 1242) were detected at concentrations documenting an observed release in four sediment samples (SD-41A, SD-46A, SD-47A, and SD-49A) collected from the downstream wetland located along the Unnamed Stream and extending to 0.0105 miles upstream of SD-41 [1, p. 51588 (Section 2.2.2), p. 51609 (Section 4.1.2.1.1); 12, pp. 4; 75, pp. 9-10; 76, p. 8; 77, pp. 8-9; 84, p. 5, 6, 8, 9, 76, 79, 84, 85; 85, pp. 4-5, 47; 102, p. 1]. An HRS-eligible wetland perimeter frontage of 0.2546 miles is documented as a Level II actual observed release environmental target [1, pp. 51589 (Table 2-3), 51625 (Section 4.1.4.3.1); 12, p. 4].

Table 37 – Sensitive Environment Value			
Sensitive Environment	Distance from PPE to Nearest Sensitive Environment	References	Sensitive Environment Value [1, Table 4-23]
Wetlands (Unnamed Stream)	0.1800 miles	1, pp. 51624 (Table 4-23), 51625 (Section 4.1.4.3.1.2); 102, p. 2	N/A*

* In accordance with HRS Section 4.1.4.3.1.2, for those sensitive environments that are wetlands, assign an additional value from HRS Table 4-24 [1, pp. 51624 (Table 4-23), 51625 (Section 4.1.4.3.1.2)].

Sum of Level II Sensitive Environments Value: 0

Level II Wetland Frontages

Table 38 – Wetland Frontage Value			
Wetland	Wetland Frontage (miles)	References	Wetland Value [1, Table 4-24]
Wetlands (Unnamed Stream)	0.2546	1, p. 51625 (Section 4.1.4.3.1.2, Table 4-24); 12, p. 4	25

Sum of Level II Wetland Frontages: 0.2546 miles

Wetlands Value (Ref. 1, Table 4-24): 25

Sum of Level II Sensitive Environments Value + Wetlands Value: 25

Level II Concentrations Factor Value: 25

4.2.4.3.1.3 Potential Contamination

Potential Sensitive Environment Targets: Not Evaluated

Potential Contamination Factor Value: Not Scored